PROGRAMMABLE POLYPHONIC SYNTHESIZER

KIWI-106

KIWITECHNICS UPGRADE

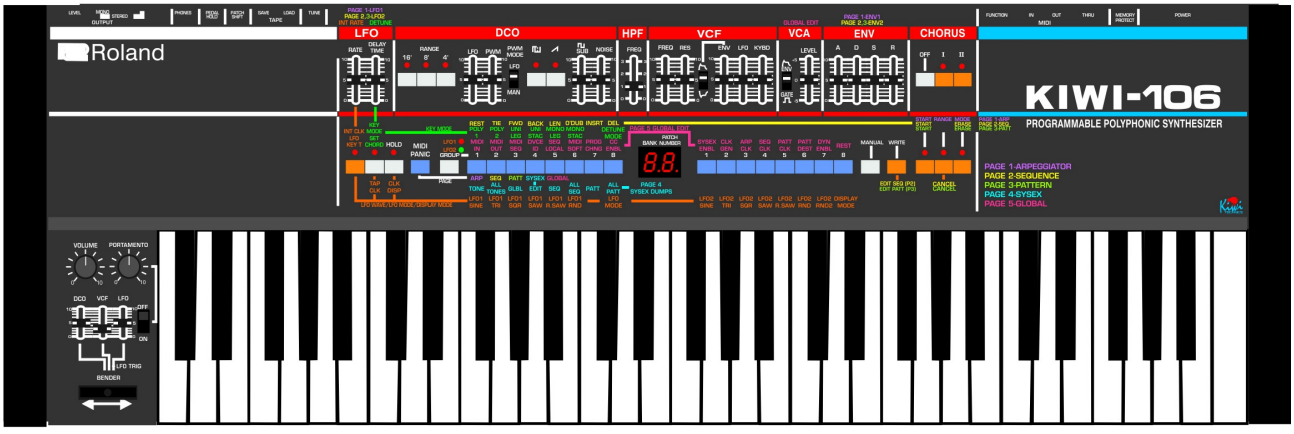

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Table of Contents

Kiwi-106 Features.....5
Kiwi 106 Flow Chart.....6
Kiwi 106 Front Panel.....7
Control Description.....8
Key Transpose.....8
Poly 1- Key Modes.....9
Poly 2 - Hold.....9
Midi Channel.....9
Group A/B.....10
Bank 1-8.....10
Patch 1-8.....10
Range 16'-4'.....10
Wave Pulse/Saw.....10
LFO Rate Slider.....11
Env Sliders.....11
VCA Slider.....11
PWM Env Control.....11
All Other Sliders & Buttons.....11
Kiwi 106 Menu System.....12
Page Menus.....12
Page 1 - Arp.....12
Page 2 - Sequence.....12
Page 3 - Pattern.....12
Juno 106 Menu System.....13
Page 4 - Sysex Dumps.....13
Page 5 – Global/Patch Parameter Edit.....14
Midi In Channel.....14
Midi Out Channel.....14
Midi Seq Out Channel.....14
Master Clock Source.....14
Midi Soft Through.....14
Midi Prog Change.....14
Midi CC.....14
Midi Sysex.....15
Midi Clock.....15

Arp Clock Divide....15
Seq Clock Divide....15
Pattern Clock Source....15
Pattern Destination....15
Dynamics Mode....15
Factory Patch Restore....16
Groups....17
Patch....17
Performance Control Section....18
Pitch Bender....18
LFO Trigger....18
Portamento....18
Juno-106 Upgrade Notes....19
Digital Oscillators....19
Factory Presets....19
Clock Display....19
Page Display Mode....19
Midi Function Switch....20
Midi Received....20
Midi Panic....20
Note Hold....20
Edit Buffer Compare....20
LFO Sync....20
Sequencer....21
A) Writing / Editing....22
C) Playing....24
Arpeggiator....25
Pattern Play....26
Chord Mode....27
Setting up with External Devices....28
Upgrade install....29
HS-60 & 106S....33
Optional LED Mod....33
Swap Back Board....33
Adjustments for the Juno-106....34
Midi Data....38

Continuous Controllers.....39
Real Time Commands.....41
NRPN Controllers.....42
Midi Sysex Support.....43
Midi Sysex Data.....44

Kiwi-106 Features

- 512 Patches can be stored and edited. It is also possible to temporarily edit any Patch
- Patches are stored in Flash memory so no battery is required.
- Bend Controls (DCO, VCF Bend, LFO Mod Level & Portamento) are stored with the Patch
- MidiCC & Sysex support for all parameters and Midi Sysex support for Patch Dump & Load
- Patch Editor Control of Parameters. Free PC/MAC editor is available from Kiwi-106.com
- NRPN & Sysex variable parameter control supports 12 bit for 4096 parameter steps
- Key Assign Modes are Poly I&II, Unison Legato & Staccato, Mono Legato & Staccato
- Portamento in Unison, Arp & Chord modes
- DCO Key Assign Detune available in all key modes except mono
- Two independent envelope generators. Each ENV Mod can select from ENV 1 or 2 and has an Inverted or Normal modes
- Two independent Low Frequency Oscillators with 6 waveforms each. LFO2 random2 wave can be clocked from the Internal clock. Each LFO Mod can select from LFO 1 or 2. LFOs can be plus and minus base note or plus base note only
- Aftertouch, Modulation Level and Dynamics via midi. Dynamics can optionally control the VCA and/or VCF. The Dynamics have been modeled on the Juno-2 with both the VCF & VCA mod turned on by default for a more natural and expressive play. This brings new life to every patch in the Kiwi-106.
- Arp/Seq/Pattern Clocks can optionally display on the KeyT LED and LFO 1 and LFO 2 clocks can optionally display on the Group lights
- Key transpose allows transposition to any key with a range of plus 2 or minus 1 octaves. Sequencer key can be shifted while playing
-

CHORD MODE

- Any chord with up to 6 notes can be set and played from any key

ARPEGGIATOR

- The Arpeggiator can be independently clocked from the Internal or External clocks, LFO2, Pattern output or midi clock. Clock options are Half Note, Quarter Note, 1/8 Note, 1/8 Note Half Swing, 1/8 Note Full Swing, 1/8 Note Triplets, 1/16 Note, 1/16 Note Half Swing, 1/16 Note Full Swing, 1/16 Note Triplets, 1/32 Note, 1/32 Note Triplets, 1/64 Note.
- The External clock can be optionally divided 48 PPQN, 24 PPQN or step (no divide)
- Arp modes are Up, Down, Up and Down, Random, As Played, 0, 1 or 2 octaves
- Arp can be Started, Stopped & Continued using Midi Commands
- Appeggiator will Output Midi Data

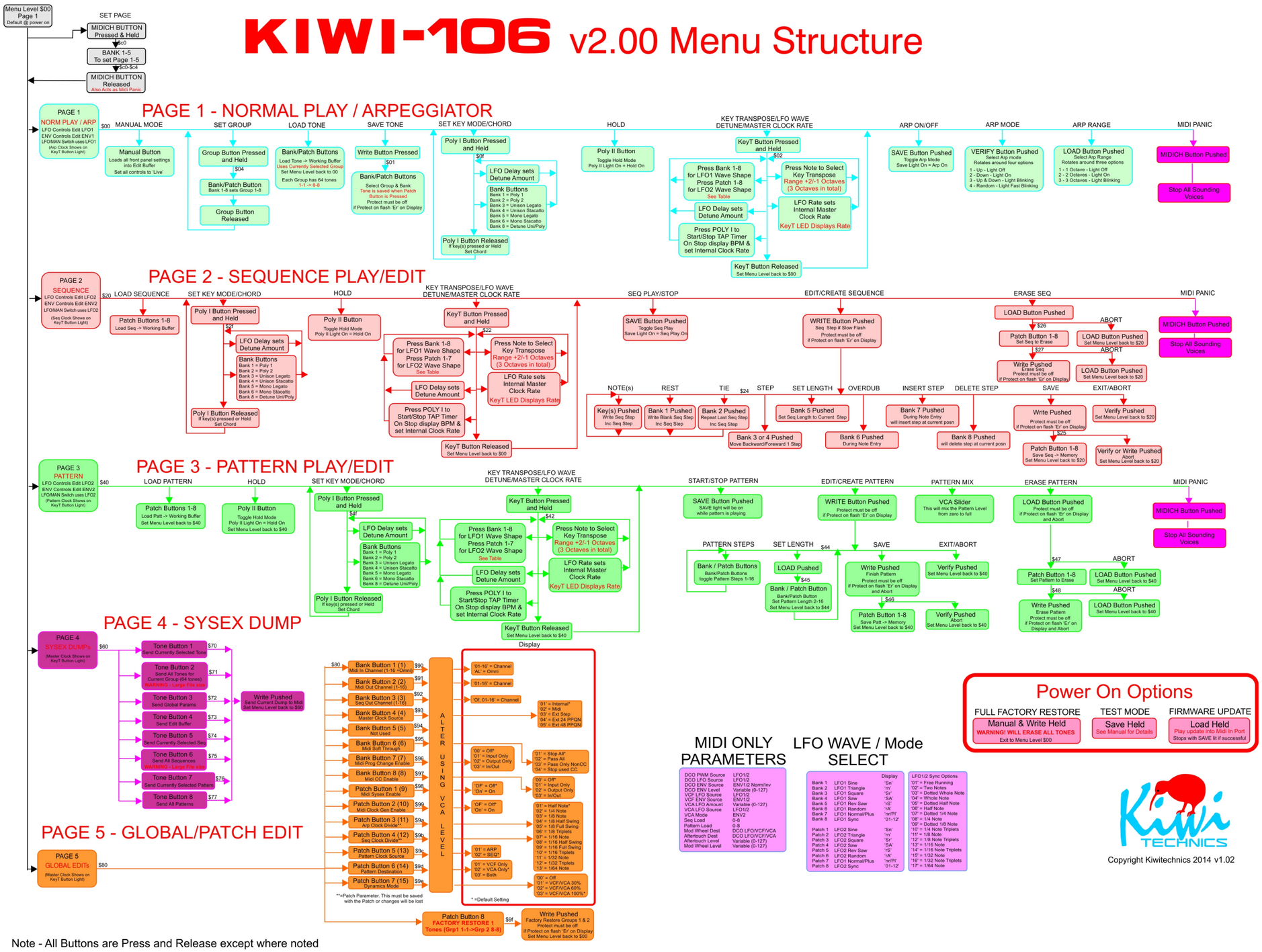
SEQUENCER

- 8 separate 124 Max step Polyphonic sequences can be created and stored
- Sequences can be edited
- The Sequencer can be independently clocked from the Internal or External clocks, LFO2, Pattern output or midi clock. Clock options are Half Note, Quarter Note, 1/8 Note, 1/8 Note Half Swing, 1/8 Note Full Swing, 1/8 Note Triplets, 1/16 Note, 1/16 Note Half Swing, 1/16 Note Full Swing, 1/16 Note Triplets, 1/32 Note, 1/32 Note Triplets, 1/64 Note.
- The External clock can be optionally divided 48 PPQN, 24 PPQN or Step (no divide)
- Sequencer will Output Midi Data

PATTERN GENERATOR

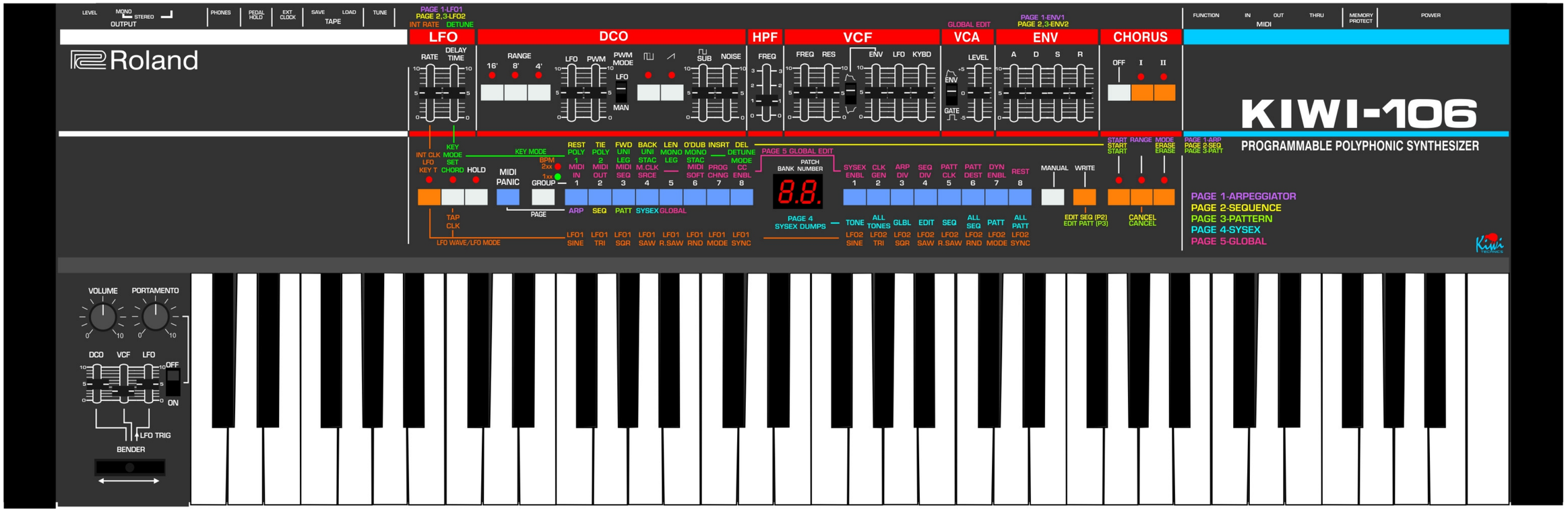
- 8 Pattern Generator patterns can be saved. The pattern can be any length between 2 and 16 steps
- The Pattern Generator can be independently clocked from the Internal or External clocks, LFO2, Pattern output or midi clock. Clock options are Half Note, Quarter Note, 1/8 Note, 1/8 Note Half Swing, 1/8 Note Full Swing, 1/8 Note Triplets, 1/16 Note, 1/16 Note Half Swing, 1/16 Note Full Swing, 1/16 Note Triplets, 1/32 Note, 1/32 Note Triplets, 1/64 Note.
- The External clock can be optionally divided 48 PPQN, 24 PPQN or step (no divide)
- Pattern Effect can be faded from no effect to full effect.

Kiwi 106 Flow Chart



Note - All Buttons are Press and Release except where noted

Kiwi 106 Front Panel



Control Description

The Control use on the Kiwi-106 Upgrade differs from the standard Juno-106 in a number or ways. In order to operate the extra features the Kiwi-106 has been divided up into 5 'Pages' with each page having a different control area.

Pages are selected using the MIDICH button and BANK buttons. Press and Hold the MIDICH and select the Page using the BANK 1-5 buttons.

Page 1 – Normal Play mode. The LFO & ENV controls will edit LFO1 and ENV1. Arpeggiator Play & Chord Play
Page 2 – Sequence Play mode. The LFO & ENV controls will edit LFO2 and ENV2. Sequences can be played or edited
Page 3 – Pattern Play Mode. The LFO & ENV controls will edit LFO2 and ENV2. Patterns can be played or Edited
Page 4 – Sysex Dumps
Page 5 – Global Parameter Edits

Key Transpose

The **Key Transpose Button** in the Kiwi-106 has a number of uses. It is used to transpose the key, set the Internal Clock Rate, set the Detune amount, set the LFO1&2 Waveforms, LFO Mode and Detune Mode.

Setting Key Transpose. While the Key Transpose Button is pressed, press the note you wish to transpose to on the keyboard. Then release the Key Transpose button. This action will occur on Pages 1, 2 & 3. The current transpose will show on the display while the button is pressed

Internal Clock Rate. While the Key Transpose Button is pressed moving the LFO Rate slider will set the Internal Clock Rate. Once the Key Transpose Button is released the LFO Slider will revert to controlling the LFO Rate. This action will occur on Pages 1, 2 & 3.

The Key Transpose LED will flash at the Internal Clock Rate while the button is pressed and at the page rate when the button is released if the Clock Display is enabled. On Page 1 the Key Transpose Light will show the Arp Clock Rate, on page 2 the Seq Clock rate and on page 3 the Pattern Clock Rate.

LFO Wave Form. While the Key Transpose Button is pressed in page 1, 2 or 3 the LFO1&2 Waveforms can be set using the Bank & Patch buttons as follows:

Bank 1 - LFO1 Sine
Bank 2 - LFO1 Triangle
Bank 3 - LFO1 Square
Bank 4 - LFO1 Saw
Bank 5 - LFO1 Rev Saw
Bank 6 - LFO1 Random
Bank 7 - LFO1 Mode (plus/normal)
Bank 8 - LFO1 Sync (cycles 1-17)

Patch 1 - LFO2 Sine
Patch 2 - LFO2 Triangle
Patch 3 - LFO2 Square
Patch 4 - LFO2 Saw
Patch 5 - LFO2 Rev Saw
Patch 6 - LFO2 Random
Patch 7 - LFO2 Mode
Patch 8 – LFO2 Sync (cycles 1-17)

Control Description

Poly 1- Key Modes

The Kiwi-106 upgrade has six Key Modes. These are selected by pressing and holding down POLY I and selecting the Key mode using the BANK buttons 1-6

Bank 1 = Poly 1
Bank 2 = Poly 2
Bank 3 = Unison Legato
Bank 4 = Unison Staccato
Bank 5 = Mono Legato
Bank 6 = Mono Staccato

Poly 1 - In this mode the 7th note played will rob the oldest voice. Voice allocation is cycled.

Poly 2 – In this mode the 7th note played is ignored. Voice allocation is cycled.

Unison Legato – All six voices are assigned to the last note that is played. The Envelope Attack stage is only triggered on a new note if all notes are lifted prior to the new note.

Unison Staccato – All six voices are assigned to the last note that is played. The Envelope Attack stage is triggered for every new note that sounds.

Mono Legato – Only voice 1 is used in the Juno-106. The Envelope Attack stage is only triggered on a new note if all notes are lifted prior to the new note.

Mono Staccato – Only voice 1 is used in the Juno-106. The Envelope Attack stage is triggered for every new note that sounds.

Poly 2 - Hold

The Poly 2 Button in the Kiwi-106 sets the Hold mode. It will toggle the Hold Mode each time it is pressed

The Poly 2 LED is as follows
Off - Hold Mode Off
On - Hold Mode On
Flashing - Hold Pedal Pressed

Midi Channel

The Midi Channel Button (MIDICH) is used in the Kiwi-106 to change the Current Page. Press and hold the MIDICH button and select the Page 1-5 using the BANK Buttons.

The MIDICH also acts as MIDI PANIC. Pressing and releasing the MIDICH button will stop all output from the Kiwi-106.

The current Page is optionally displayed on Page 1-3 and always displayed on Pages 4-5 on the two digit display. The Display will cycle through the various items that are relevant to the current Page.

LED Display Page 1
First 'P1' = Page One
2nd 'Gx' = Current Group (1-8)
3rd 'yz' = Bank & Patch (11-88)

LED Display Page 2
First 'P2' = Page Two
2nd 'SE' = Seq Mode
3rd ' z' = Current Seq # (1-8)

LED Display Page 3
First 'P3' = Page Three
2nd 'PA' = Pattern Mode
3rd ' z' = Current Pattern # (1-8)

LED Display Page 4
First 'P4' = Page Four
2nd 'du' = Dump Mode
3rd ' x' = Dump # (1-8)

LED Display Page 5
First 'P5' = Page Five
2nd 'gL' = Global Edit Mode
3rd 'xx' = Global Param # (1-15)
4th 'xx' = Global Parameter Value

Control Description

Group A/B

Page 1 - The Group Button is used in the Kiwi-106 to change the Current Group. Press and hold the GROUP Button and select the Group using the BANK Buttons 1-8. BANK1 will select Group1 through to BANK 8 which will select Group 8.

Page 2-5 - The Group Button is not used and is ignored

Bank 1-8

Page 1 - The Bank Buttons are used to select the Bank portion of the Patch. Each Patch is made up of a Group (1-8), Bank (1-8) and a Patch (1-8) making 64 Patches on any Group. There are 8 Groups making a total of 512 Patches (8 x 64).

Page 2 - The Banks Buttons are used during Seq Edit as follows
Bank 1 – Insert Rest
Bank 2 – Insert Tie
Bank 3 – Step Backwards
Bank 4 – Step Forwards
Bank 5 – Set Seq Length
Bank 6 - Overdub
Bank 7 – Insert Step
Bank 8 – Delete Step

Page 3 - The Bank Buttons are used to toggle Pattern Steps 1-8 during Pattern Edit.

Page 4 - The Bank Buttons are used to select the Sysex Dump type to send. Dumps are not sent until the 'WRITE' button is pushed.

Page 5 - The Bank Buttons are used to select the Global Parameter to edit.

Patch 1-8

Page 1 - The Patch Buttons are used to select the Patch portion of the Patch. Each Patch is made up of a Group (1-8), Bank (1-8) and a Patch (1-8) making 64 Patches on any Group. There are 8 Groups making a total of 512 Patches.

Page 2 - The Patch Buttons are used to Select a Sequence # (1-8).

Page 3 - The Patch Buttons are used to Select a Pattern # (1-8). The Patch Buttons are used to toggle Pattern Steps 9-16 during Pattern Edit.

Page 4 - The patch Buttons are not used.

Page 5 - The Bank Buttons are used to select the Global Parameter to edit.

Range 16'-4'

The Range buttons will select the Octave of the current Patch and will work in Pages 1, 2 & 3

Wave Pulse/Saw

The Waveform Buttons will select the Waveform of the current patch and will work in in Pages 1, 2 & 3

Control Description

LFO Rate Slider

The LFO Rate Slider has three modes of operation.

Pages 1-3 - When the KEY TRANSPOSE button is being held down the LFO Rate Slider will edit the Internal Clock Rate.

Page 1 – The LFO Slider will edit the LFO1 Rate
Page 2&3 – The LFO Slider will edit the LFO2 Rate
Page 4&5 – The LFO Rate Slider will have no effect

Env Sliders

Page 1 – The ENV Sliders will edit the ENV1 Stages
Page 2&3 – The ENV Sliders will edit the ENV2 Stages

Page 4&5 – The ENV Sliders will have no effect

VCA Slider

Page 1,2 – The VCA Slider will edit the VCA level.
Page 3 – The VCA Slider will edit the Pattern Mix.

Page 4 – The VCA Slider is not used
Page 5 – The VCA Slider will edit Global Parameter values

PWM Env Control

The PWM hardware in the Juno-106 has a single control line for all six voices. The result of this is, if the PWM source is set to ENV then the PWM on all the sounding voices will retrigger for each new note played
.

All Other Sliders & Buttons

Page 1,2&3 – All Sliders and Buttons not mentioned already will behave normally

All sliders will display the value 0-99 for a short time whenever they are moved. The actual internal range is 0-4096 so the display is for reference only.

Page 4&5 – All Sliders and Buttons not mentioned already will have no effect.

Kiwi 106 Menu System

The menu system in the Kiwi-106 Upgrade is complex. This is unavoidable due to the number of features and the limited number of buttons available.

The parameters for editing can mostly be accessed using the menu system.

Some Parameters are available using midi control or External Editor only.

Patch parameters are all saved with the Patch and will be changed whenever a Patch is loaded. Global Parameters will remain unchanged on Patch loads.
The external editor can control all parameters in any 'Page' or mode the synth is in and full details can be found in the Editor User guide.

Page Menus

The 106 has five 'Pages'. This is necessary to cover all the available options. The Page is changed by pressing and holding the MIDICH button and selecting the Page using the BANK 1-5 Buttons.

The Page data can optionally display on Page 1-3 and will always show on pages 4-5. The digits will scroll the different items for each page level.

The Group number can be 1-8. The Bank/Patch number can be 11 to 88

Page 1 - Arp

Page 1 is normal play mode. The digit display (if enabled) will show 'P1', current Group number & current Bank/Patch number and in a 2s loop. If Display mode is disabled only the current the Bank/Patch will display. The current Group will only display while the Group Button is pressed while in this mode.

The SAVE, VERIFY & LOAD buttons will control the Arp. This is detailed in the Menu flow chart and the Arp Section

Display Example for Page 1
First Display 'P1' - Page 1
2nd Display ' G5' - Group 5
3rd Display '24' - Bank 2/Patch 4
The Group, Bank & Patch numbers can be 1-8

Page 2 - Sequence

Page 2 is Sequence mode. The digit display will show 'P2', 'SE' & current Seq number 1-8 and in a 2s loop if enabled .

The Seq number can be 1-8

The SAVE, VERIFY, LOAD and BANK buttons will control the Seq & Seq Edit. This is detailed in the Sequence Section

Display Example for Page 2
First Display 'P2' - Page 2
2nd Display 'SE' - Sequence
3rd Display ' 1' - Seq Number 1

Page 3 - Pattern

Page 3 is Pattern mode. The digit display will show 'P3', 'PA' & current Pattern number 1-8 and in a 2s loop if enabled .

The Pattern number can be 1-8

The SAVE, VERIFY, LOAD and BANK/PATCH buttons will control the Pattern & Pattern Edit. This is detailed in the Pattern Section

Display Example for Page 3
First Display 'P3' - Page 3
2nd Display 'PA' - Pattern
3rd Display ' 2' - Pattern Number 2

Juno 106 Menu System

Page 4 - Sysex Dumps

The digit display will show 'P4', 'du'.

To start a midi dump press a PATCH BUTTON (1-8) and then the WRITE BUTTON. The dump will not begin to send until the WRITE is pressed.

The output from these can be recorded using midi software (e.g. midiOX). These can be played into the Kiwi-106 at any time to restore the Patch, Sequence or Pattern back to the same state that it was when the recording was made.

Most SysEx dumps include the number which the Patch, Sequence or Pattern was stored under at the time of the dump. The dump will always load back to this same position. To load it to a different memory position the number can be edited in the SysEx file. Details of file layouts can be found in the Sysex Section at the end of the manual.

Normal play is not possible in Page 4 or 5 modes

Note - Write Protect must be off to Load Dumps

IMPORTANT - All of the dumps (except the edit buffer dump) Loading and Saving will overwrite the working buffers with the saved copy. **Save any edits you wish to keep before any dumps in or out.**

IMPORTANT – Except for sysex dump 4 (edit buffer), when a Patch, Sequence or Pattern is dumped it is the saved copy that is dumped and not the edited version

NOTE - some of the output files are large.

Dump 1 - Dump Current Patch
Dump 2- Dump All Patches *
Dump 3 - Dump Global Parameters
Dump 4 - Dump Edit Buffer
Dump 5 - Dump Current Sequence
Dump 6 - Dump All Sequences *
Dump 7 - Dump Current Pattern
Dump 8 - Dump All Patterns
*= Large file size

IMPORTANT – when playing a type 2 or 6 dump into the 106 it will need a 500mS delay between each sysex message

Juno 106 Menu System

Page 5 – Global/Patch Parameter Edit

The digit display will show 'P5', 'gL', Global Parameter number (1-15) & Value.

Global Parameter Editing is done using the VCA Level Slider

Global Parameters are as follows:*
Bank 1 (1) - Midi In Channel
Bank 2 (2) – Midi Out Channel
Bank 3 (3) – Seq Midi Out Ch
Bank 4 (4) – Master Clock Source
Bank 5 (5) – Not Used
Bank 6 (6) – Midi Soft Thru
Bank 7 (7) – Midi Prog Change Enable
Bank 8 (8) – Midi CC Enable
Patch 1 (9) – Midi Sysex Enable
Patch 2 (10) – Midi Clock Gen Enable
Patch 3 (11) – Arp Clock Divide*
Patch 4 (12) – Seq Clock Divide*
Patch 5 (13) – Pattern Clock Source
Patch 6 (14) – Pattern Destination
Patch 7 (15) – Dynamics Enable*
Patch 8 – Factory Patch Restore
*=Patch Parameter

Midi In Channel

Bank 1

The Midi In Channel is set using the VCA Level Control

Range is '01'-'16' or 'On' (Omni)

Midi Out Channel

Bank 2

The Midi Out Channel is set using the VCA Level Control

Range is '01'-'16'

Midi Seq Out Channel

Bank 3

The Seq Midi Out Channel is set using the VCA Level Control

Range is '01'-'16' or 'Of' (Off)

Master Clock Source

Bank 4

This sets the Master Clock Source from the internal, external or midi clocks

'01' = Internal
'02' = Midi
'03' = Ext Step
'04' = Ext 24 PPQN
'05' = Ext 48 PPQN

Bank 5 is not used

Midi Soft Through

Bank 6

The Midi Soft Through sets the way the 106 handles Midi data.

'01'= Stop All Midi
'02' = Pass All Midi
'03' = Pass only Non-CC
'04' = Pass only CC that the 106 hasn't used

Midi Prog Change

Bank 7

The Midi Program change command can be optionally disabled.

'OF'= Off
'On' = On

Midi CC

Bank 8

The Kiwi106 can be optionally disable Midi CC input and output.

'01'= Disabled
'02' = Midi CC input Enabled
'03' = Midi CC input & Output Enabled

Juno 106 Menu System

Midi Sysex
Patch 1 – (Display 9)

Sysex Input can be optionally disabled.

Note – The sysex ID request will work even if sysex is diabled

'OF'= Off
'On' = On

Midi Clock
Patch 2 – (Display 10)

The Kiwi106 can optionally output the internally generated clock as a midi clock command.

'OF'= Off
'On' = On

Arp Clock Divide
Patch 3 – (Display 11)

The Kiwi106 Arpeggiator Clock can be Divided from the Master Clock Source.

'01'=Half Note (48/Step)
'02'=Quarter note (24/Step)
'03'=8th note (12/Step)
'04'=8th note, 1/2 swing (14,10/Step)
'05'=8th note, full swing (16,8/Step)
'06'=8th note triplets (8/Step)
'07'=16th note (6/Step)
'08'=16th note, 1/2 swing (7,5/Step)
'09'=16th note, full swing (8,4/Step)
'10'=16th note triplets (4/Step)
'11'=32nd note (3/Step)
'12'=32nd note triplets (2/Step)
'13'=64th note triplets (1/Step)

Seq Clock Divide
Patch 4 – (Display 12)

The Kiwi106 Sequence Clock can be Divided from the Master Clock Source.

'01'=Half Note (48/Step)
'02'=Quarter note (24/Step)
'03'=8th note (12/Step)
'04'=8th note, 1/2 swing (14,10/Step)
'05'=8th note, full swing (16,8/Step)
'06'=8th note triplets (8/Step)
'07'=16th note (6/Step)
'08'=16th note, 1/2 swing (7,5/Step)
'09'=16th note, full swing (8,4/Step)
'10'=16th note triplets (4/Step)
'11'=32nd note (3/Step)
'12'=32nd note triplets (2/Step)
'13'=64th note triplets (1/Step)

Pattern Clock Source
Patch 5 – (Display 13)

The Kiwi106 Pattern Clock can be from the Arpeggiator or Sequence Clocks.

'01'= ARP Clock
'02' = SEQ Clock

Pattern Destination
Patch 6 – (Display 14)

The Pattern Destination can send the pattern to the VCF Cutoff or the VCA Level or Both

'01'= VCF Cutoff
'02' = VCA Level
'03' = Both

Dynamics Mode
Patch 7 – (Display 15)

The Midi Dynamics can be enabled or disabled. If midi dynamics are disabled notes will sound at the internal level

'OF'= Off
'01' = Low Level
'02' = Mid Level
'03' = High Level

Juno 106 Menu System

Factory Patch Restore

Patch 8

There are two types of Factory Restore on the Kiwi106

Type 1 Restore will restore the Kiwi106 Factory Patches on Groups 1 & 2 (128 in total).

While in Page 5 'gL' mode press PATCH 8 followed by the WRITE BUTTON.

The Kiwi106 will stop responding for about 2 seconds.

Note – This will not restore Groups 3-8 or any Global parameters.

Type 2 Restore will restore all the Kiwi106 Factory Patches on Groups 1 - 8 (512 in total).

WARNING - THIS ACTION WILL CLEAR ALL MEMORY AND ALL GLOBAL PARAMETERS WITHOUT CONFIRMATION.

To clear the entire Kiwi106 back to original factory condition press the MANUAL & WRITE buttons while powering on the Kiwi106.

The Kiwi106 will stop responding for about 5 seconds.

Preset Section

Groups

There are 8 Groups in the Kiwi-106 Upgrade, each group can have 64 Patches. Groups are changed by pressing and holding the GROUP Button and then selecting the Group 1-8 by using the BANK buttons.

Note - Changing the Group will also load a new Patch. If you have an edited Patch in the edit buffer you should save this first or it will be lost.

Note – When the WRITE button has been pushed in Page 1 the display will flash and the Group and Bank buttons can be used to select a group and/or Bank without the Patch Saving. This means you can write a Patch to any Group and Bank. The Patch is not saved until the PATCH button part of the selection is pressed.

Patch

Patches are selected by selecting a GROUP 1-8, BANK 1-8 and PATCH 1-8 giving a total of 512 Patches.

Note - The memory protection switch on the Juno-106 will prevent memory writing. The write button will not function if the rear panel switch is in the protected position. The Display will briefly show 'Er' if a write is attempted with the protect on.

Note - If the Edit Buffer differs from the Saved version the right hand decimal point will flash on the display. These changes will be lost if another Patch is loaded or the power is switched off. To make them permanent the Patch must be saved.

You can only select one patch at a time

All patches on Group 1&2 (11 to 88) contain factory presets (128 in total) and all other groups (3-8) contain a generic Patch and all patches in all Groups can be Edited and saved (512 in total)

The factory presets have been made close to the original Juno-106 patches. All these can be edited and restored. When selecting a patch select a combination of the Bank button and the Patch button. The Bank and Patch selected will show on the display.

Performance Control Section

Pitch Bender

This allows you to change the pitch of the DCO or the VCF Cutoff. The amount of the Pitch Bend and VCF Cutoff mod can be adjusted using the DCO and VCF Sliders next to the bend lever.

Note - These Slider settings are saved with the Patch. This was not possible with the original Juno-106

The Programmed setting can be overwritten by moving the DCO or VCF Sliders. The new setting can be saved with the Patch if desired.

LFO Trigger

The level of the DCO LFO Modulation from the Bend Lever can be adjusted using the LFO TRIGGER LEVEL slider

On all factory programs the LFO button has been configured to a moderate level of DCO LFO level on the DCO to give a vibrato effect.

Note – The LFO source from the bend lever trigger does not include the LFO Delay and is always present.

Note - This Slider setting is saved with the Patch. This was not possible with the original Juno-106

The Programmed setting can be overwritten by moving the LFO Slider. The new setting can be saved with the Patch if desired.

Portamento

Portamento is available only on Poly, Unison, Arp and Chord Modes. The Portamento On/Off and Rate are set on the Panel next to the Bend Lever.

The Portamento setting can be saved with the Patch. Changing the Portamento On/Off or moving the Rate Control will change the saved setting in the edit buffer.

Note - This Slider setting is saved with the Patch. This was not possible with the original Juno-106

Note - The Portamento setting will only be changed and overwritten in the Patch while the Portamento Switch is set to 'ON' due to the internal hardware in the Juno-106. Turning the Portamento Switch to 'OFF' is the same as setting the Portamento Rate knob to Zero. If the switch is off then the Portamento Rate will be saved as zero when the patch is written to memory.

Juno-106 Upgrade Notes

Digital Oscillators

The Juno-106 Synthesizer uses programmable dividers from a single master oscillator to generate the pitch of the notes. While this does create very a stable pitch it does create some issues.
Because the dividers are being reprogrammed every time the pitch for that voice changes, the leading edge of the DCO pulse is constantly changing in relation to the other voices.
This is a 'feature' of the Juno-106 hardware and cannot be altered.

This is especially noticeable when playing in Unison as all six voices are playing the same pitch but the start point of the voice waves will not be the same. The audible result of this is that random notes can sound 'thin' with much of the bass portion missing at certain start point combinations. Anything that effects the pitch of a voice (detune, pitch bending, lfo amount, Portamento etc) will change the DCO wave voice start points and change the sound.

Master Clock

The Internal Master Clock is generated within the Kiwi106. This clock is then used to generate the Arpeggiator & Sequencer clocks. The Master clock can be from several sources.
1) Internal. The rate is set by the LFO Rate Slider while the KeyT button is being pressed
2) Midi Clock

3) External. An External Clock can be fed into the 'PATCH' input on the rear of the Juno-106. This can then be selected to drive the Master Clock. This clock will count each time the Patch Input changes from 0v to 5-15v (Positive pulse).
The External Clock can be further divided by 24 or 48 to suit PPQN

Factory Presets

The 128 factory presets in Group 1&2 have been made close to the original Juno-106 presets.

Note - These can be restored if required.

Clock Display

The internal clock will display the rate in BPM (Beats Per Minute) on the display whenever it is changed. Because the display is only two digits the Red/Green Group lights are also used as follows

5-99 BPM	No Lights
100-199 BPM	Green Light
200-299 BPM	Red Light

The current Page Clock will show on the KEY TRANSPOSE LED.

Pages 1-3 - While the Key Transpose button is held the Internal Clock rate will display on the LED
Page 1 – The Arpeggiator Clock will Display
Page 2 – The Sequencer Clock will Display
Page 3 – The Pattern Clock will Display (Arp or Seq)
Page 4 & 5 – Off

Page Display Mode

The scrolling digit display can be optionally disabled. When enabled the display will continuously cycle the Page number and other page data. When disabled the Page data will only scroll once whenever a page control button is pressed

The Page Display Mode can be edited by pressing and holding the POLY I button and pressing the Patch 8 button. This setting is Off by default.

Midi Function Switch

This switch has no effect with the Kiwitechnics Juno-106 Upgrade. Full midi control is always available and this switch is ignored.

Midi Received

Midi data received will flash the Left decimal point of the Digit Display light if it is recognized by the Kiwi-106.

Midi Panic

The MIDICH button also acts as Midi Panic and will cancel any sounding notes including internal.

To stop all output from the Kiwi-106 press and release MIDICH.

Note Hold

The Original Juno-106 has no Note Hold except when using a hold pedal. A Hold Function has been added to the Kiwitechnics Kiwi106 Upgrade front panel and uses the POLY 2 BUTTON. Pressing POLY 2 will toggle Hold on or off. The POLY 2 LED will be lit when hold is on.

Note - The POLY 2 BUTTON does not change the Key Mode in the Kiwitechnics Kiwi106 Upgrade

The Poly2 light will flash when the Hold Pedal is used

Edit Buffer Compare

Whenever the edit buffer does not match the saved patch showing on the display the right decimal point on the display will blink.

To retain these changes when the patch is changed or the Juno-106 is powered off the patch must be written to memory.

LFO Sync

LFO1&2 can be free running or synced to the master clock. Each LFO sync can have an independent divide ratio.

As the LFO has to time the clock and will take full two cycles to correctly sync there will be an initial period where the LFO is not synced correctly. This is especially noticeable with slow clock speeds and slow divides

'01' = Free Running
'02' = Two Notes
'03' = Dotted Whole Note
'04' = Whole Note
'05' = Dotted Half Note
'06' = Half Note
'07' = Dotted 1/4 Note
'08' = 1/4 Note
'09' = Dotted 1/8 Note
'10' = 1/4 Note Triplets
'11' = 1/8 Note
'12' = 1/8 Note Triplets
'13' = 1/16 Note
'14' = 1/16 Note Triplets
'15' = 1/32 Note
'16' = 1/32 Note Triplets
'17' = 1/64 Note

Sequencer

The Juno-106 Upgrade contains a polyphonic sequencer that has the capacity of 124 step automatic playing. Up to 6 notes can be played at a time so writing a chord is possible.

The clock for the Sequencer is taken from the Master Clock and can be further divided using Global Parameters Edit. The Seq Clock Divide parameter is located under Patch Button 4

Note - If the Master clock source is set to External Clock or Midi Clock and no ext/midi clock is present the sequence will not run.

Note - If the master clock source is midi or external the sequence will not begin playing until the first clock is received

PATCH Buttons

The patch buttons will select the sequence to play. If a sequence is selected during sequence play the currently playing sequence will finish before the new sequence is loaded.

SAVE Button

This button is used to start or stop the sequencer playing. Each time you press this button the sequencer will start or stop.

LOAD Button

This followed by the seq number (Patch button 1-8) is used to erase a sequence. After the Seq number is selected the erase is done when the write button is pressed. Press VERIFY to abort.

A) Writing / Editing

The memory protect switch on the rear of the Juno-106 must be set to Off to write or erase a sequence

The only way to erase or blank a sequence is by using the Seq Erase Menu Option (While in Page 2, press LOAD, Seq number, WRITE - see the menu map). **If you choose an existing sequence when Seq Write is pressed then any step(s) you write will overwrite all notes in the existing step(s) already in the sequence unless you press the OVERDUB button (Bank 6) while you play notes.** The BANK 3 (backwards) and BANK 4 (forwards) buttons will allow non destructive stepping within a sequence.

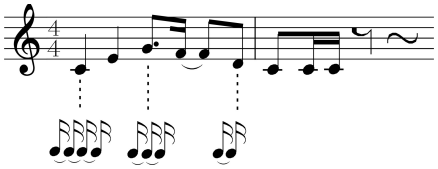
e.g. if the existing sequence is C, D, E, F, G and you step to the third step and play the chord C E G the resulting sequence will now be C, D, CEG(chord), F, G. You will have overwritten the third step.

Note – When Sequence Edit Mode is entered a generic Tone is loaded for editing. The last used Patch will be reloaded on exiting Sequence Edit Mode. **Any temporary edits made to a Patch will be lost when Sequence Edit Mode is entered.**

You can write the pitch by playing the keyboard (or midi keyboard), and the rhythm by pressing the Tie button and the Rest button.

(1) Find the shortest time value in the phrase you wish to write. Then divide the longer time values by that shortest one.

(e.g)



2) Press the WRITE button to begin Seq write/edit.

(3) By playing the keyboard and using the Tie button and Rest button, write steps one after another.

Note - if more than 6 notes are used in one step only the last 6 notes used will play.

(4) If writing is complete press the Write button followed by a Patch button to Save the Sequence to permanent memory or the VERIFY Button to exit edit mode. The SAVE button will start the sequence playing on the next clock received. If the Seq is not written to memory the sequence will be lost if the Juno-106 is powered off or another sequence is loaded. Pressing the SAVE button again will stop the sequence playing and the indicator will go out. (refer to **Sequencer Playing** in the next section)

(5) Return the Memory Protect Switch to the Off Position.

Button use in detail

Bank 1 – Rest

When the Bank 1 button is pressed while in edit mode a blank step will be inserted at the current sequence step. Note - this button can only be used if no notes are being pressed.

Bank 2 – Tie

When the Bank 2 button is pressed while in edit mode and while notes are being pressed a tie step will be inserted at the current sequence step. A tied step will start the note in the sustain stage of the envelope when it is played. Note – A tie can only follow a sequence step that contains note data. Therefore it cannot be placed after a rest or at the first step in a sequence.

Bank 3 – Step Back

When the Bank 3 button is pressed while in edit mode the sequence will step back one position if possible and sound the step.

Bank 4 – Step Forward

When the Bank 4 button is pressed while in edit mode the sequence will step forward one position if possible and sound the step. It is possible to step one position past the last step so new steps can be added at the sequence end point unless the sequence is full (124 steps).

Bank 5 – Set Length

When the Bank 5 button is pressed while in edit mode the sequence length will be set to the step showing on the display. The step showing will be the last step to play and all steps after this will be erased.

Bank 6 – Overdub

When the Bank 6 button is pressed while in edit mode and notes are being played the sequence step notes already in the sequence step will be combined with any being played to a maximum of six notes.

Bank 7 – Insert Step

When the Bank 7 button is pressed while in edit mode and notes are being held the sequence step is inserted at the current step that is showing on the display. Note – if the sequence is full (124 steps) the last step will be lost when the Bank 7 button is pressed.

Bank 8 – Delete Step

When the Bank 8 button is pressed while in edit mode the sequence step that is showing on the display is deleted and all steps after this point are moved up one position.

C) Playing

Load Sequence

A Sequence can be loaded in two ways. A Sequence is loaded **manually** by pressing a Patch Button 1-8 while in Page 2. The Sequence that is stored under the Patch button selected will be loaded to memory

.

A Sequence can be assigned to a Patch and can load **automatically** when the Patch is loaded. To do this place the Sequence number 1-8 in the Load Sequence Field in the Patch Parameter Editing (midi editing only) or save the Patch with the sequence running. Place a zero in this field if you do not want a Sequence to load. The last Sequence will stay in memory and continue to play (if enabled) in this case.

If you press the SAVE button the indicator will light up and the data written into the sequencer will be played. The first note of the sequence will only sound once a clock has been received. This allows a seq to be queued to start. When all the notes are played the data will return to the beginning and be played again from the start. Pressing the SAVE button once more (it's indicator will go out) will stop playing immediately. The tempo of the playing will be determined by the clock source. If the clock source is the Internal Clock then the tempo will be set by the LFO Rate Slider while the Key Transpose button is being pressed. The Rate Knob will have no effect if the clock source is anything other than the Internal clock.

* If you stop the Sequence part way through and then restart it the data will start from the beginning.

* If you wish to only play the data once, put some rests are the end so it is easier to stop the sequence in the correct place.

Playing notes while a sequence is playing will set the Sequencer Key Transpose. It is therefore a simple matter to change the Sequencer key up or down. The transpose range is -1 octave to + 2 octaves

Note - If a new sequence or Patch is loaded while a sequence is playing the load of the Patch and Seq and pattern will delay until the current sequence reaches the end and is about to loop back to the start. At this point the Patch and Sequence (if auto load enabled) and Pattern (if auto load enabled) will then load and the next note(s) to sound will be with the new selection.

If the Sequencer is on (SAVE light on) when a Patch is saved the Sequencer will be switched on and the currently selected sequence will begin to play when the Tone is loaded. If the Seq is off when a Patch is saved the Seq state will be unaltered when that Patch is loaded. Saving the Patch with the sequence on will also load the current playing sequence into the Load Sequence parameter in the Patch. The effect of this is that the Sequence will load & begin to play when the Patch is loaded.

Arpeggiator

The KiwiTechnics Juno-106 Upgrade has a built in Arpeggiator that can be applied to any sound.

Arpeggiator Mode is entered by pressing the SAVE Button while in Page 1.

The SAVE button will light.

Note – The Arp settings are saved with the Patch. i.e. if the Arp is on when the Patch is saved it will be on when the Patch is loaded

The clock for the Arpeggiator can be divided from the Master Clock. The Arp Clock Divider parameter is located under Patch Button 3

The behavior or the Arpeggiator can be set using the VERIFY & LOAD buttons. The VERIFY will set the style and will cycle through up only, down only, up & down and random. The LOAD button will cycle through the range which can be 0, 1 or 2 octaves. These are saved with the Patch.

Note - If the Master clock source is set to the Ext Clock or Midi Clock the Arp will not play if the clock is not present.

Canceling Arpeggiator Mode.
Arpeggiator mode can be stopped by pressing the SAVE button While in Page 1. The SAVE button light will go out.

Note - If the Arpeggiator notes held are spread over more than 1 octave and more than one octave is selected in the Arp Range the notes played will be as follows. All the first octave notes held will play followed by the same pattern moved up one or two octaves. The result of this will be the first note of the second pass can be lower than the last note of the first pass. This can sound odd if you have selected one direction for the Arp Mode.

If the Arp is running when the PAGE is changed to 2 or 3 it will continue to run. This way an Arp can be applied to a Seq output.

If the Arp is on (SAVE light on) when a Patch is saved the Arp will be switched on when the Tone is loaded. If the Arp is off when a Patch is saved the Arp state will be unaltered when that Patch is loaded.

Pattern Play

The KiwiTechnics Juno-106 Upgrade has a pattern system that can be applied to any Patch. There are 8 independent patterns which are stored under the Patch buttons 1-8.

Pattern Play.
Pattern Play can be toggled on and off by pressing the SAVE button while in Page 3 Mode.

The Pattern Clock can be selected from the Arpeggiator or Sequencer clocks.

Note - If any of the follow conditions are present the Pattern will not run or sound.
1) If the Pattern Mix Level is set to full and the first step is off, if the Pattern clock source selected (Arp or Seq) is set to External or midi Clock and no ext or midi clock is present.
2) The Pattern will only sound if a pattern destination (VCF or VCA) is enabled
3) The Pattern will only sound if the Pattern Mix Level is not zero.

Loading and Playing a Pattern
A Pattern can be loaded in two ways. A pattern is loaded **manually** by pressing a Patch Button 1-8 while in Page 3 Mode. The pattern that is stored under the Patch button selected will be loaded to memory. The pattern can be started and stopped by pressing the SAVE button.

A pattern can be assigned to a Patch and can load **automatically** when the Patch is loaded. To do this place the pattern number 1-8 in the Load Pattern Field (midi editing only). Place a zero in this field if you do not want a pattern to load. The last pattern will stay in memory and continue to play (if enabled) in this case.

If the Pattern is on (SAVE light on) when a Patch is saved the Pattern will be loaded and switched on when the Patch is loaded. If the Pattern is off when a Patch is saved the Pattern state will be unaltered when that Patch is loaded.

Edit Pattern
Edit mode is entered by pressing The WRITE button while in Page 3 .

Note - The memory must be Write Enabled to enter Edit mode

Exit Pattern Edit mode by pressing the WRITE button followed by the Patch number 1-8 to store the pattern under that number or the VERIFY button to abort editing without storing the Pattern. If aborted, the edited pattern will remain in the temporary buffer and continue to sound until it is overwritten or the Juno-106 is powered off.

To edit a pattern press the Bank & Patch buttons to add or remove sections of the pattern. Depending on the length of the pattern up to 16 pattern steps can be toggled on or off.

Pattern Display
During Edit mode only the pattern will display on the LED display as follows:

The step number will display 1 to the length set and a 'u' if the step is not sounding and a 'n' if the step is sounding. For steps 1-8 the step number is on the left and the step status on the right. For steps 9-16 the step number is on the right and the step status on the left.

Pattern Length.
The pattern length can be changed from 2-16. This is set by pressing and releasing the LOAD button while in edit mode followed by a Bank or Patch button. The Range is 2 (Bank 2) to 16 (Patch 8).

Erasing a Pattern.
A pattern can be cleared in two ways.

1) by setting all the Pattern Steps to On ('n')

2) pressing the LOAD button while not in Pattern Edit Mode followed by the Pattern Number (Patch button 1-8) followed by the WRITE button.

Note - The memory must be Write Enabled to store or erase a Pattern

Chord Mode

A Chord is set by playing the Chord and then pressing and releasing the POLY1 Button while the keys of the chord are being held. The chord that is set will then play for each key pressed as the base note.

Note - it is best to set the chord using middle 'C' as the base note.

Note – As the Poly I button is also used to set key modes this must be done with no note(s) pressed or a chord will be set.

As only one chord can be played at a time the keys played have last note priority.

Changing a chord.
To change a chord play the new chord and press and release the POLY1 Button while the chord keys are pressed.

Canceling Chord Mode.
To cancel chord mode press and release the POLY1 Button with no notes pressed.

Setting up with External Devices

Midi Notes

Midi though should be used if multiple units are being used on the midi chain to reduce delays. While every effort has been made to make the midi as fast as is possible within the KiwiTechnics Kiwi-106 upgrade there will always be small delays between the midi input and midi output as the commands need to be interpreted which cannot be done until a full command arrives. Full midi command details are at the end of the manual.

External Clock

An External Clock can be fed into the 'PATCH' input on the rear of the Juno-106. This can then be selected to drive the Master Clock. This clock will count each time the Patch Input changes from 0v to 5-15v (Positive pulse).

Hold Pedal

Any pedal that shorts the tip to ground when not pressed can be used. It will need to go open circuit when pressed to suit the Juno-106 hardware.

Upgrade install

Disclaimer.

This modification is at your own risk and Kiwitechnics will not be held liable for any damage done by not doing this modification correctly.

If you are in any doubt at all or do not understand any part of this document then have this work done by a professional.

UNPLUG THE JUNO-106!

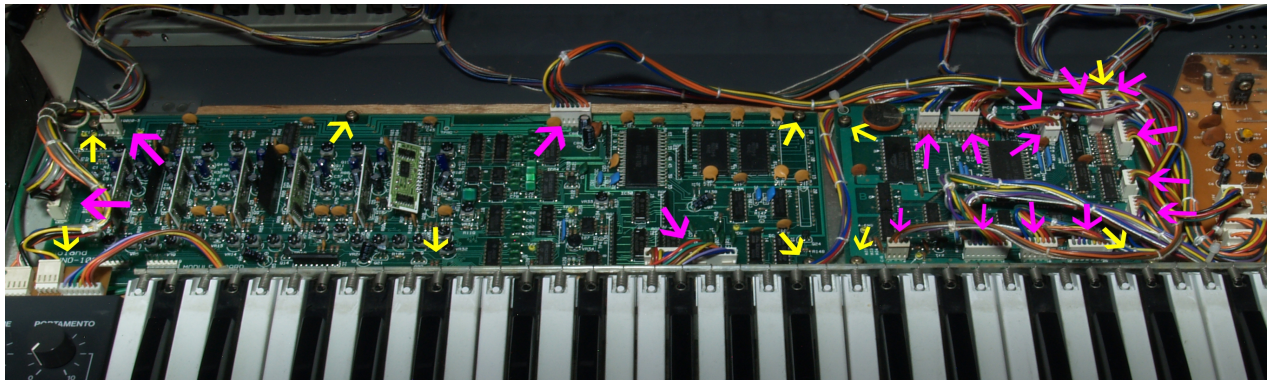
There are dangerous voltages inside the unit and it must not be opened until the power plug is removed from the power supply.

The KiwiTechnics Kiwi-106 Upgrade must be installed by a competent technician with the correct tools or damage to your Juno-106 can occur. KiwiTechnics will not be responsible for damage done to your precious Juno-106 if this upgrade is not fitted correctly.

The voice board cpu needs to be removed and replaced with a 64 pin socket and daughter board which is supplied with the KiwiTechnics Juno-106 Upgrade. These instructions are supplied as a guide for your technician only and it is your responsibility to have this done professionally. This can take about 30mins depending on your skill level.

Step 1) Opening the Juno-106 - After removing the four screws located in the end panels the top can be opened.

Step 2) Removing the cpu & voice board. If the 106 is a 106S or HS-60 then the keyboard will also need to be removed to gain access to the cpu & voice boards. This is done by removing the 5 large screws on the underside. Unplug all the cables from the cpu and voice boards. Remove the 10 screws holding both boards into the 106. it is a good idea to mark the cpu board cables with a felt pen so that you get them back into the correct sockets. Several of the plugs are similar and it is easy to get them swapped.

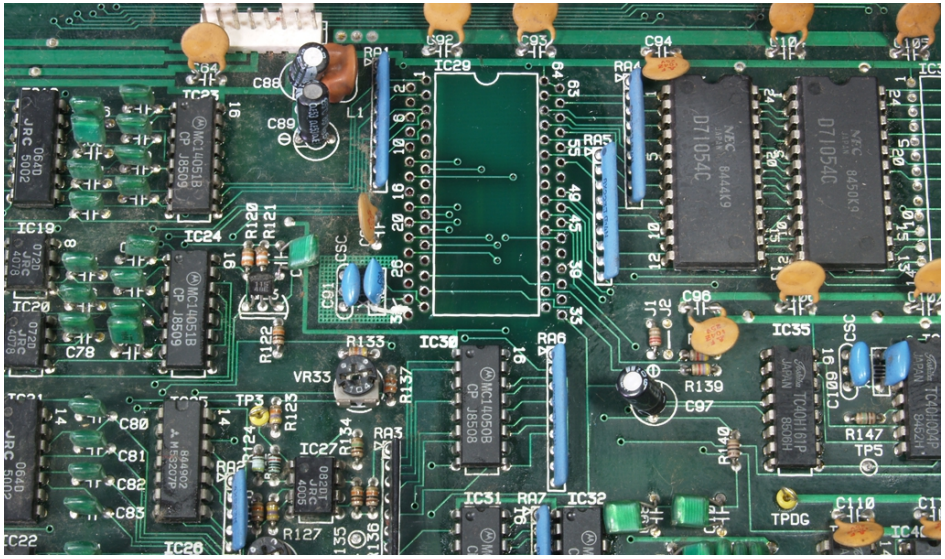


Step 3) Unplug the cables marked with the purple arrows and the screws marked with the yellow arrows (10). Remove both the voice and the cpu boards.

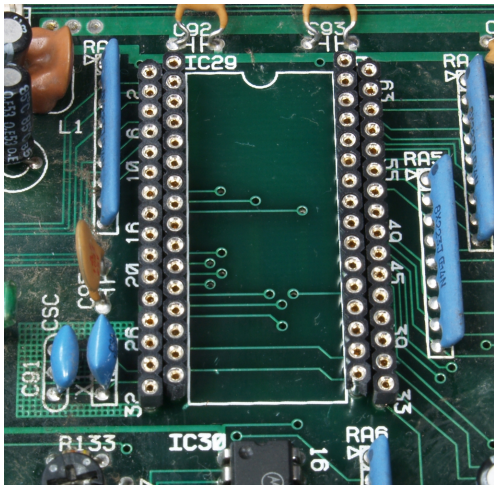
Step 4) Desolder the Voice board CPU (IC29) and fit the supplied 64 pin Daughter Board.

It is very important that this step is done correctly.

On the top side of the voice board underneath the IC29 CPU are some fine tracks that will be damaged and difficult to repair if all the solder is not removed correctly (see photo). **All the solder must be removed from all the 64 holes and the pins free of the hole edges before the CPU is lifted.** All the CPU pins should be able to move freely in the holes which shows that they are not still soldered to the hole sides. The best way to achieve this is with a good vacuum desoldering tool. A combination of a quality Solderwick and a hand vacuum can be used but you will need to take care as these can cause damage to the board as they can jump and damage tracks as they are triggered. Copper is very soft at 300+ degrees and is easily lifted from the surface especially on these older boards. If tracks are damaged they will need to be repaired before proceeding.



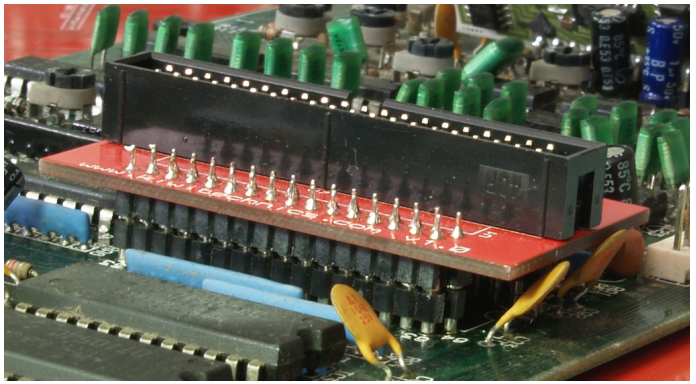
Step 5) Carefully solder in the supplied 64 Pin Sockets. The way to do this is solder in the end pins of each row only and then check that they are seated correctly and vertical before soldering the rest of the pins.



Step 6) Bend the two caps C92 & C93 away from the socket so that they are at 45°. C95 should also be bent away a little bit. This is so they avoid hitting the daughter board as it is pressed in (see photo).

Step 7) Fit the CPU daughter board. This is a very tight fit and will require some force to insert correctly. Make sure all the pins are in all the holes and press in firmly. This will seat the board into the holes. Then with the 106 voice board on a static free firm surface and something firm directly under the cpu area you need to press down very firmly using a cloth to protect your fingers until the daughter board is seated correctly. It is best to press one end at a time and then the sides until it is fully inserted. The photo shows the board in the final position.

Step 8) Fit the KiwiTechnics CPU Upgrade Board into the 106. Refit the Voice board and reconnect all the cables to both boards. Refit all the screws (10) into both boards to secure then



Step 9) Connect the supplied 40 pin cable between the KIWI-106 CPU board and the Voice board.

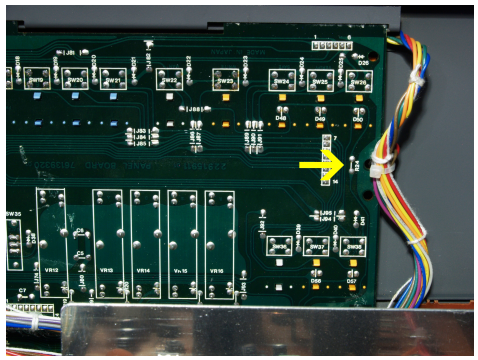
Step 10) Older voice boards have an eprom fitted into the IC37 location (near the board edge). If the voice board has an eprom fitted then this needs to be removed. This should be fitted into a socket but if not it will also need to be desoldered.

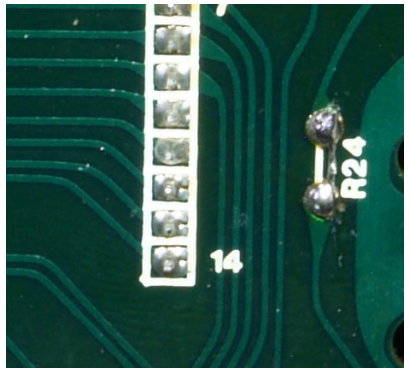
HS-60 & 106S

The HS-60 & 106S have the cpu & voice board farther apart than the 106. These are separated by a supporting leg for the keyboard. This keyboard support leg is also in the way of the kiwi106 cable. This leg needs to be removed from the underside of the keyboard and the Kiwisix CPU board moved closer to the voice board. The keyboard mounting for this mounting leg can no longer be used but there is sufficient mounting screws using the remaining screws to hold the keyboard firmly. The kiwi106 cable can then be fitted as normal between the cpu board & the voice board.

Optional LED Mod

The LED's for the LOAD, VERIFY & SAVE buttons share a common dimming resistor. This is fine if only one light is on at a time but is not ideal for the upgrade. The Kiwi-106 upgrade uses these lights in combinations to show Arp, Seq & Pattern Modes. This can be fixed by putting a link across R24 on the far right of the front panel board as viewed with the board in place. This link can be fitted on the rear of the board and it is not necessary to remove the front panel.



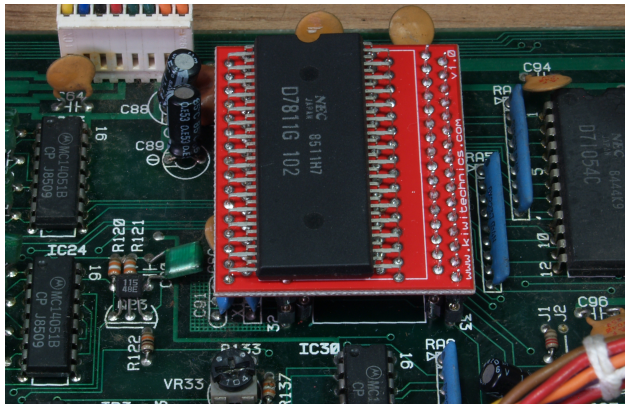


Swap Back Board

The allows the Roland Juno-106 to be restored to original operation. When the voice board cpu is removed it can be soldered into the swap back board. To restore the Juno-106 to original operation remove the ribbon cable, the voice board from the 106, the voice board cpu daughter board and Kiwi-106 CPU board. The voice board cpu daughter board is a tight fit and can be difficult to remove. A lever like a midsized Hex Key with a piece of cloth under it (to avoid damaging the voice board) can be helpful. Be gentle and ease one corner a little at a time. Avoid damaging the surrounding components.

Fit the Swap Back daughter board with the original cpu fitted into it. This is a very tight fit and will require some force to insert correctly. Make sure all the pins are in all the holes and press in. This will seat the board into the holes. Then with the 106 voice board on a static free firm surface and something firm directly under the cpu area you need to press down very firmly using a cloth to protect your fingers until the swap back daughter board is seated correctly. It is best to press one end at a time and then the sides until it is fully inserted.

Replace the original Juno106 cpu board and plug in all the cables



Adjustments for the Juno-106

THE JUNO-106 WILL BE ON WITH THE LID OPEN DURING THIS PROCEDURE AND THERE ARE LETHAL VOLTAGES PRESENT!

LEAVE THIS TO A PROFESSIONAL IF YOU ARE AT ALL UNSURE.

The Roland Juno-106 can be adjusted while it is apart. To do the adjustments you will require an accurate digital voltage meter, an oscilloscope and a small screwdriver. A suitable tuner for PC is APTuner from www.aptuner.com or the ClearTune App for smartphones.

1) Warm up the Juno-106

Leave the Synth running for at least 10 minutes to let the electronics stabilize. Center the Fine Tune Knob on the rear and set Bend Level to the center.

2) Check the Power Supply

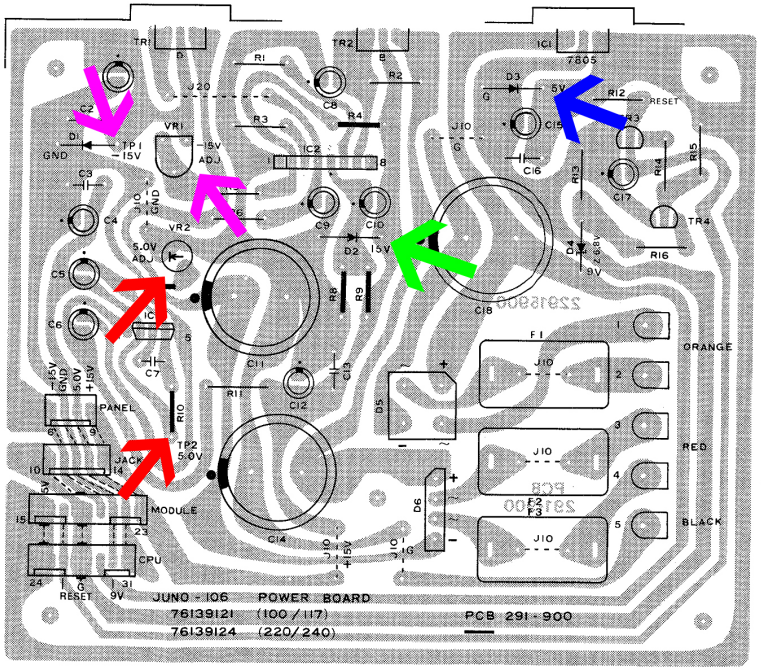
Using voltage meter adjust the power supply. IMPORTANT – do not adjust the voltages without the meter attached to the correct test point or damage may occur to the synth.

1) Red Arrows. Connect the meter to the point R10 marked TP2 and adjust the trim marked VR2 to get +5v ± 10mv

2) Purple Arrows. Connect the meter to the point D1 marked TP1 and adjust the trim marked VR1 to get -15v ± 10mv

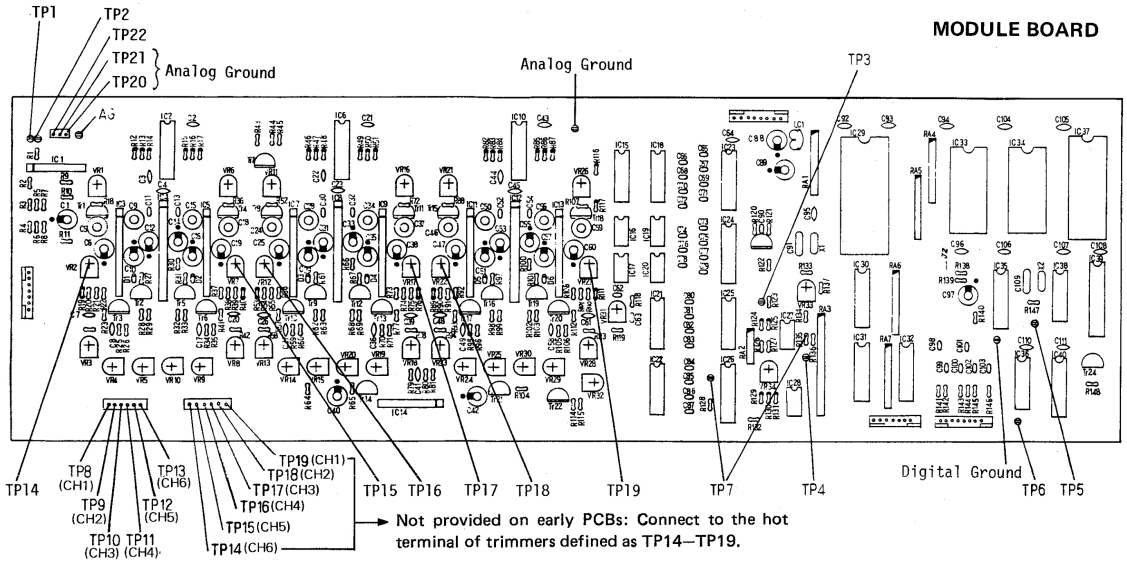
3) Green Arrow. Verify that there is +15v at D2. Adjusting VR1 (-15v) will also effect this.

4) Blue Arrow. Check D3 for +5v. This is not adjustable and if it is wrong then replace IC1 (LM7805 +5v Regulator)



3) Enter TEST MODE. The next adjustments use a special test mode that is built into the Kiwi-106 Upgrade. This is entered by Pressing and Holding the SAVE button while the Juno-106 is powered on. The display will show '1_' when test mode is active.

Use this Drawing from the Juno-106 Service Notes to locate the test points



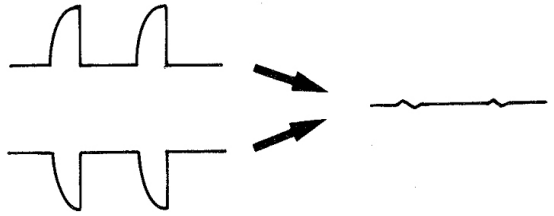
4) Connect the DVM to TP3 marked. Press and release the MIDICH button. This sets the output MUX to zero volts. Pressing any Bank Button will cancel this. Adjust VR33 for 0v.

5) Connect the DVM to TP7 and adjust VR34 to read in the range +0.25v to +0.27v.

VR NO.	30	25	20	15	10	5
CH NO.	1	2	3	4	5	6

6) Press Bank 1 to cancel the output MUX override.

7) **VCA OFFSET**. Connect an oscilloscope to TP8. Press and Release BANK 1 to set the correct Patch Sound. Using TP8 for Voice 1 through to TP13 for Voice 6 adjust the VR in the diagram to get minimum thump as keys are pressed.



8) Press and Release BANK 3 to set the correct Patch Sound.

9) **VCF RESONANCE**. Using the oscilloscope on TP19 for Voice 1 through to TP14 for Voice 6 press and hold C4 (middle C) and adjust the trimmer to get a 4.8v peak to peak for each voice.

VR #	26	21	16	11	6	1
CH #	1	2	3	4	5	6

10) **VCA GAIN**. Connect an oscilloscope to TP8. Using TP8 for Voice 1 through to TP13 for Voice 6 adjust the VR in the diagram to get 6v peak to peak as C4 (middle C) is pressed.

VR #	27	22	17	12	7	2
CH #	1	2	3	4	5	6

8) Press and Release BANK 4 to set the correct Patch Sound.

11) **VCF FREQUENCY**. Using the oscilloscope on TP8 for Voice 1 through to TP13 for Voice 6 press and hold C4 (middle C) and adjust the trimmer to get a 248Hz (B3 pitch) for each voice. Each press of C4 will rotate the voice and the voice number that is sounding will display on the right digit. A suitable tuner for PC is APTuner from www.aptuner.com or the ClearTune App for smartphones.

VR #	29	24	19	14	9	4
CH #	1	2	3	4	5	6

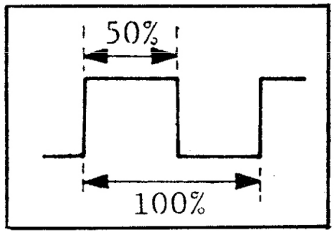
12) **VCF WIDTH**. Using a tuner attached to the output the oscilloscope on TP8 for Voice 1 through to TP13 for Voice 6 press and hold C6 and adjust the trimmer to get a 992Hz (B5 pitch) for each voice.

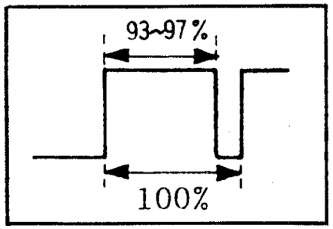
VR #	28	23	18	13	8	3
CH #	1	2	3	4	5	6

Note. The tuning in 11 (VCF FREQ) and 12 (VCF WIDTH) interact so repeat both until result is ±10 cents on the tuner.

13) **NOISE LEVEL**. Press and Release BANK 6 to set the correct Patch Sound. Connect the Oscilloscope to TP8, play any key and adjust VR32 for an average of 4v peak to peak on the output

14) **PWM ADJUST**. Press and Release BANK 5 to set the correct Patch Sound. Connect an oscilloscope to TP8. On one voice only adjust VR31 to get a 50% duty cycle. Tolerance is 48% to 52%. Check this is correct for all voices. Move PWM control to 10 and check all outputs are within 93%-97%.





15) **CHORUS BOARD ADJUSTMENTS**. Use the service manual for Chorus adjustments.

Upgrade Label

The Kiwitechnics KIWI-106 Upgrade comes with one label for the outside of the Juno-106.

Midi Data

Function	Transmitted	Recognized	Notes
Basic Channel	1-16	1-16	If Omni selected the Kiwi106 will recognize any midi channel
Note Number	24(C1)-108(C8)	0-127	Notes that are received outside the Kiwi106 range of 24-108 are transposed to the nearest octave within range.
Mode	O	O	Voice Modes need to be changed using Midi Control or Sysex commands
Velocity Note On Note Off	 X X	 X X	Midi Note Velocity can be disabled using Global Dynamics Variable. If disabled midi notes will use the Internal Velocity Level.
Aftertouch Keys Channels	 X X	 X X	
Pitch Bender	O	O	Midi and internal bends are additive within the Kiwi106.
Control Change	O	O	Only if Midi CC option is Enabled. See Control Change Tables for details **NOTE - If the Vyzex editor is running midiCC Control changes will not be transmitted even if enabled**
Program Change	O	0-127	If CC0=0 then CC32 & Program change select Patch 1-512. Each CC32 number (0 - 3) accesses 128 Patches using Program Change (0-127)
System Exclusive	O	O	Only if Midi Sysex option is Enabled - See Sysex Table for details
System Real Time Clock Commands	O	O	Will Transmit from Master Clock if Clock Output is enabled. Input clocks are passed through to midi out unaltered and with minimal delay. Midi Clocks are recognized within the Kiwi106 only if the clock source has been set to midi on the Master clock source
Modulation	O	O	Midi and internal Modulation are additive within the Kiwi106

Notes X=No O=Yes

Supported Midi Messages	Status	Second	Third	Notes
Note Off	$8n (128-143)	$kk	$yy	n = 0-15 midi channel kk = note number (0-127) - Notes outside range 24-108 are transposed to the nearest octave yy = Don't care (ignored)
Note On	$9n (144-159)	$kk	$yy	n = 0-15 midi channel kk = note number (0-127)-outside 24-108 are transposed to the nearest Octave yy = 0=Note Off, 1-127 = Note Velocity. Notes are sent at velocity set by Global Parameter
Continuous Controllers	$bn (160-191)	$kk	$yy	n = 0-15 midi channel $kk & $yy see CC table
Program Change	$cn (192-207)	0-127		n = 0-15 midi channel If CC0 = 0 then for CC32 = 0 for Patches 1-128 1 for Patches 129-256 2 for Patches 257-384 3 for Patches 385-512
Channel Aftertouch	$dn (208-223)	$kk	---	

Pitch Bend	$en (224-239)	$kk	$yy	n = 0-15 midi channel kk = Least Significant 7 bits yy = Most Significant 7 bits Note - Midi pitch bend is mixed with internal bend Internal hardware can only support 12 bits so the 2 LSB are dropped
				Note $xx = hex number

Continuous Controllers

Continuous Controllers	Second	Third	Notes
Bank Select MSB	$00 (00)	$00-$01	0=Bank Selection, 1=Pattern Selection, 2=Seq Selection Used in conjunction with CC32 Bank Select LSB
Modulation Wheel Level	$01 (01)	$00-$7f (0-127)	
Breath Controller	$02 (02)	$00-$7f (0-127)	Not Supported
Portamento Time	$05 (05)	$00-$7f (0-127)	Sets Portamento Time
NRPN MSB	$06 (06)	$00-$7f (0-127)	Supported. See NRPN Detail Table
Overall Volume	$07 (07)	$00-$7f (0-127)	Sets VCA Level
DCO Range	$08 (08)	$yy	yy = $00-$1f (0-31) 16' $20-$3f (32-63) 8' $40-$7f (64-127) 4'
DCO Wave	$09 (09)	$yy	yy = $00-$1f (0-31) Off $20-$3f (32-63) Ramp $40-$5f (64-95) Pulse $60-$7f (96-127) Ram+Pulse
DCO PWM Mod Amount	$0a (10)	$00-$64 (0-100)	Source is selected by DCO PWM Control Note – Reduced Range
DCO PWM Control	$0b (11)	$yy	yy = $00-$0f (0-15) Manual $10-$1f (16-31) LFO 1 $20-$2f (32-47) LFO 2 * $30-$3f (48-63) ENV 1 Normal * $40-$4f (64-79) ENV 1 Inverted * $50-$5f (80-95) ENV 2 Normal * $60-$7f (96-127) ENV 2 Inverted *
DCO LFO Mod Amount	$0c (12)	$00-$7f (0-127)	
DCO LFO Source	$0d (13)	$yy	yy = $00-$3f (0-63) LFO 1 $40-$7f (64-127) LFO 2 *
DCO Envelope Mod Amount	$0e (14)	$00-$7f (0-127)	Polarity and Source is selected by DCO ENV Source *
DCO ENV Source	$0f (15)	$yy	yy = $00-$1f (0-31) ENV 1 Normal * $20-$3f (32-63) ENV 1 Inverted * $40-$5f (64-95) ENV 2 Normal * $60-$7f (96-127) ENV 2 Inverted *
LFO Mode	$10 (16)	$yy	yy = $00-$1f (0-31) LFO1&2 Normal * $40-$7f (64-127) LFO1&2 Plus *
LFO 1 Wave	$12 (18)	$yy	yy = $00-$0f (0-15) Sine $10-$2f (16-31) Triangle $20-$3f (32-63) Saw $40-$5f (64-95) Rev Saw $60-$6f (96-111) Square $70-$7f (112-127) Random
LFO 1 Rate	$13 (19)	$00-$7f (0-127)	
LFO 1 Delay	$14 (20)	$00-$7f (0-127)	
LFO 2 Wave	$15 (21)	$yy	yy = $00-$0f (0-15) Sine $10-$2f (16-31) Triangle $20-$3f (32-63) Saw $40-$5f (64-95) Rev Saw $60-$6f (96-111) Square $70-$7f (112-127) Random
LFO 2 Rate	$16 (22)	$00-$7f (0-127)	
LFO 2 Delay	$17 (23)	$00-$7f (0-127)	

Continuous Controllers

Continuous Controllers	Second	Third	Notes
LFO 1 Mode	$18 (24)	$yy	$yy = $00-$07 (0-7)- Free Running $08-$0f (8-15) - Sync Two Notes $10-$17 (16-23) - Sync Dotted Whole Note $18-$1f (24-31) - Sync Whole Note $20-$27 (32-39) - Sync Dotted Half Note $28-$2f (40-47) - Sync Half Note $30-$37 (48-55) - Sync Dotted 1/4 Note $38-$3f (56-63) - Sync 1/4 Note $40-$47 (64-71) - Sync Dotted 1/8 Note $48-$4f (72-79) - Sync 1/4 Note Triplets $50-$57 (80-87) - Sync 1/8 Note $58-$5f (88-95) - Sync 1/8 Note Triplets $60-$67 (96-103) - Sync 1/16 Note $68-$6f (104-111) - Sync 1/16 Note Triplets $70-$73 (112-115) - Sync 1/32 Note $74-$77 (116-119) - Sync 1/32 Note Triplets $78-$7f (120-127) - Sync 1/64 Note
LFO 2 Mode	$19 (25)	$yy	$yy = $00-$07 (0-7)- Free Running $08-$0f (8-15) - Sync Two Notes $10-$17 (16-23) - Sync Dotted Whole Note $18-$1f (24-31) - Sync Whole Note $20-$27 (32-39) - Sync Dotted Half Note $28-$2f (40-47) - Sync Half Note $30-$37 (48-55) - Sync Dotted 1/4 Note $38-$3f (56-63) - Sync 1/4 Note $40-$47 (64-71) - Sync Dotted 1/8 Note $48-$4f (72-79) - Sync 1/4 Note Triplets $50-$57 (80-87) - Sync 1/8 Note $58-$5f (88-95) - Sync 1/8 Note Triplets $60-$67 (96-103) - Sync 1/16 Note $68-$6f (104-111) - Sync 1/16 Note Triplets $70-$73 (112-115) - Sync 1/32 Note $74-$77 (116-119) - Sync 1/32 Note Triplets $78-$7f (120-127) - Sync 1/64 Note
Bank Select LSB	$20 (32)	$00-$7f (0-127)	Selects Bank sets for Program Select $00 (0) for Patches 1-128 $01 (1) for Patches 129-256 $02 (2) for Patches 257-384 $03 (3) for Patches 385-512
Sub Level	$21 (33)	$00-$7f (0-127)	
Noise Level	$22 (34)	$00-$7f (0-127)	
NRPN LSB	$26 (38)	$00-$7f (0-127)	Supported. See NRPN Detail Table
VCF Low Pass Cutoff	$29 (41)	$00-$7f (0-127)	
VCF Low Pass Resonance	$2a (42)	$00-$7f (0-127)	
VCF Pitch Follow	$2b (43)	$00-$7f (0-127)	
High Pass Filter Cutoff	$2c (44)	$yy	yy = $00-$1f (0-31) HPF Off $20-$3f (32-63) HPF 1 $40-$5f (64-95) HPF 2 $60-$7f (96-127) HPF 3
VCF LFO Mod Amount	$2d (45)	$00-$7f (0-127)	
VCF LFO Source	$2e (46)	$yy	yy = $00-$3f (0-63) LFO 1 * $40-$7f (64-127) LFO 2 *
VCF Envelope Mod Amount	$2f (47)	$00-$7f (0-127)	Polarity is selected by VCF ENV Source
VCF ENV Source	$30 (48)	$yy	yy = $00-$1f (0-31) ENV 1 Normal $20-$3f (32-63) ENV 1 Inverted $40-$5f (64-95) ENV 2 Normal * $60-$7f (96-127) ENV 2 Inverted *
ENV 1 Attack	$33 (51)	$00-$7f (0-127)	
ENV 1 Decay	$34 (52)	$00-$7f (0-127)	
ENV 1 Sustain	$35 (53)	$00-$7f (0-127)	

Continuous Controllers

Continuous Controllers	Second	Third	Notes
ENV 1 Release	$36 (54)	$00-$7f (0-127)	
Load Sequence	$37 (55)	$00-$08 (0-8)	0 = Do not load sequence * 1-8 = Load Seq 1-8 All other numbers ignored
Load Pattern	$38 (56)	$00-$08 (0-8)	0 = Do not load Pattern * 1-8 = Load Pattern 1-8 All other numbers ignored
Chorus Off/I/II	$39 (57)	$yy	yy = $00-$3f (0-63) Chorus Off $40-$5f (64-95) Chorus On I $60-$7f (96-127) Chorus On II
VCA LFO Mod Amount	$3b (59)	$00-$7f (0-127)	*
VCA LFO Source	$3c (60)	$yy	yy = $00-$3f (0-63) LFO 1 * $40-$7f (64-127) LFO 2 *
VCA Mode	$3d (61)	$yy	yy = $00-$3f (0-31) Gate $40-$5f (32-63) ENV 1 $60-$6f (96-111) ENV 2 *
Midi Control (Midi Start/Stop Enable) Note: if a patch is saved with ARP, SEQ and/or Pattern running the midi Start Enable will also be saved for each section running	$3e (62)	$yy	yy = $00-$0f (0-15) All Off $10-$1f (16-31) ARP Enabled $20-$2f (32-47) SEQ Enabled $30-$3f (48-63) Pattern Enabled $40-$4f (64-79) ARP+SEQ Enabled $50-$5f (80-95) ARP+PATTERN Enabled $60-$6f (96-111) SEQ+PATTERN Enabled $70-$7f (112-127) ARP+SEQ+PATTERN Enabled
Hold Pedal	$40 (64)	$yy	yy = $00-$3f (0-63) Off $40-$7f (64-127) On
ENV 2 Attack	$41 (65)	$00-$7f (0-127)	
ENV 2 Decay	$42 (66)	$00-$7f (0-127)	
ENV 2 Sustain	$43 (67)	$00-$7f (0-127)	
ENV 2 Release	$44 (68)	$00-$7f (0-127)	
DCO Bend Amount	$45 (69)	$00-$7f (0-127)	
VCF Bend Amount	$46 (70)	$00-$7f (0-127)	
DCO LFO Mod Amount	$47 (71)	$00-$7f (0-127)	
Internal Clock Rate	$48 (72)	$00-$7f (0-127)	
NRPN Data Plus	$60 (96)		Supported. See NRPN Detail Table
NRPN Data Minus	$61 (97)		Supported. See NRPN Detail Table
NRPN Data LSB	$62 (98)		Supported. See NRPN Detail Table
NRPN Data MSB	$63 (99)		Supported. See NRPN Detail Table
RPN Data LSB	$64 (100)		Not Supported
RPN Data MSB	$65 (101)		Not Supported
After Touch Level *	$67 (103)	$00-$7f (0-127)	*
Key Mode	$68 (104)	$yy	yy = $00-$0f (0-15) Poly 1 $10-$1f (16-31) Poly 2 $20-$2f (32-47) Unison Legato $30-$3f (48-63) Unison Staccato $40-$4f (64-79) Mono Legato $50-$7f (80-127) Mono Staccato
Key Assign Detune	$69 (105)	$00-$7f (0-127)	
Key Assign Detune Mode *	$6a (106)	$yy	yy = $00-$3f (0-63) Mono/Unison $40-$7f (64-127) Mono/Unison/Poly
Internal Velocity **	$6b (107)	$01-$7f (1-127)	Sets Juno-106 internal Key velocity level

Continuous Controllers

Continuous Controllers	Second	Third	Notes
Arpeggiator Mode	$6c (108)	$yy	$yy = $00-$1f(0-31) Up $20-$3f(32-63) Down $40-$4f(64-79) Up & Down $50-$5f(80-95) Random $60-$7f (96-127) As Played
Arpeggiator Range	$6d (109)	$yy	$yy = $00-$1f(0-31) 0 Octave $20-$3f(32-63) 1 Octave $40-$7f(64-127) 2 Octaves
Pattern -> VCF Cutoff *	$71 (113)	$yy	yy = $00-$3f (0-63) Off $40-$7f (64-127) On
Pattern -> VCA Level *	$72 (114)	$yy	yy = $00-$3f (0-63) Off $40-$7f (64-127) On
Pattern Level **	$73 (115)	$00-$7f (0-127)	
All Sound off	$78 (120)		Stops all output immediately
All Notes off	$7b (123)		Stops all output immediately

* = Midi control Only

** = Global Parameter

Real Time Commands

Midi Clock	$f8 (248)		Midi Timing Clock
Start	$fa (250)		Start Arp/Sequence/Pattern Play
Stop	$fc (252)		Stop Arp/Sequence/Pattern Play
Continue	$fb (251)		Continue Arp/Sequence/Pattern Play

NRPN Controllers

NRPN MSB	$63 (99)	$60 (96)	Kiwitechnics ID. Any NRPN that does not have this number as the MSB will be ignored
NRPN LSB	$62 (98)	$07-$3f (7-63)	See table Note: the Kiwi106 supports 12 bit control only so the two lowest bits are ignored
NRPN Data	$06 & $26 (6 & 38)	14 bits of data	$6 (6) is upper 7 bits and is optional $26 (38) is lower 7 bits and is optional (only 5 bits are used) These are combined to make one 12 bit control (6) 0xxxxxxx (38) 0yyyyyzz = 0000xxxx xxxyyyyy
NRPN Data Increment	$60 (96)		Will increment the current NRPN by one count
NRPN Data Decrement	$61 (97)		Will decrement the current NRPN by one count
Overall Volume	$07 (07)	0-4096	Sets VCA Level
DCO PW/PWM Mod Amount	$0a (10)	0-4096	
DCO LFO Mod Amount	$0c (12)	0-4096	
DCO ENV Mod Amount	$0e (14)	0-4096	
LFO1 Rate	$13 (19)	0-4096	
LFO1 Delay	$14 (20)	0-4096	
LFO2 Rate	$16 (22)	0-4096	
LFO2 Delay	$17 (23)	0-4096	
Sub Level	$21 (33)	0-4096	
Noise Level	$22 (34)	0-4096	
VCF Low Pass Cutoff	$29 (41)	0-4096	
VCF Low Pass Resonance	$2a (42)	0-4096	
VCF Key Track	$2b (43)	0-4096	
VCF LFO Mod Amount	$2d (45)	0-4096	
VCF Envelope Mod Amount	$2f (47)	0-4096	
ENV 1 Attack	$33 (51)	0-4096	
ENV 1 Decay	$34 (52)	0-4096	
ENV 1 Sustain	$35 (53)	0-4096	
ENV 1 Release	$36 (54)	0-4096	
VCA LFO Mode Amount	$3b (59)	0-4096	
ENV 2 Attack	$41 (65)	0-4096	
ENV 2 Decay	$42 (66)	0-4096	
ENV 2 Sustain	$43 (67)	0-4096	
ENV 2 Release	$44 (68)	0-4096	
DCO Bend Amount	$45 (69)	0-4096	
VCF Bend Amount	$46 (70)	0-4096	
DCO LFO Mod Amount	$47 (71)	0-4096	
Key Assign Detune	$69 (105)	0-4096	
Pattern Level	$73 (115)	0-4096	

Midi Sysex Support

Function	Transmitted	Recognized	Notes
Basic ID	1-16	1-16	Set using Device ID in Global Variable
Load	O	O	
Dump	O	O	

Function			
Device Enquiry	$F0 $7E <MIDI CHANNEL> $06 $01 $F7		
Device Enquiry Response	$F0	Sysex Start	
	$7F	Non Rel time reply	
	xx	Midi Channel (0-15)	
	$06	Enquiry Message	
	$02	Enquiry Reply	
	$00 $21 $16	Kiwitechnics Manufacture ID	
	$60	Kiwitechnics ID	
	$03	Product Family ID (Kiwi-106)	
	$00	Product ID	
	xx	Major Program Version Byte	
	xx	Minor Program Version Byte	
	xx	Major BootLoader Version Byte	
	xx	Minor BootLoader Version Byte	
	xx	Build Number	
	xx	Decide ID (Global Parameter #3)	
	$F7	End of Sysex	

Midi Sysex Data		
		Notes $nn = Hexadecimal Data - Decimal data is in Brackets e.g. $0a (10)
Sysex Header	$f0	Sysex Start
	$00 $21 $16	Kiwitechnics Manufacturers ID
	$60	Kiwitechnics ID
	$03	Kiwitechnics Juno-106 ID
	nn	Device ID ($00-$0f) (Juno-106 Device ID 1-16)
	xx	Command ID (see table 1.0) $01 = Request Global Dump $02 = Transmit/Receive Global Dump $03 = Request Patch Edit Buffer Dump $04 = Transmit/Receive Patch Edit Buffer Dump $05 = Request Patch Dump $06 = Transmit/Receive Patch Dump $07 = Request Pattern Dump $08 = Transmit/Receive Pattern Dump $09 = Request Seq Dump $0a = Transmit/Receive Seq Dump $0b = Request Patch Name $0c = Transmit/Receive Patch Name $0d = Request Patch Parameter $0e = Transmit/Receive Patch Parameter $0f = Request Global Parameter $10 = Transmit/Receive Global Parameter $11 = Request Pattern Edit Buffer Dump $12 = Transmit/Receive Pattern Edit Buffer Dump $13 = Request Sequence Edit Buffer Dump $14 = Transmit/Receive Sequence Edit Buffer Dump
	Data	Depending on command type (see table 1.0)
	$f7	Sysex Footer

WARNING! Sysex dumps have the ability to put non valid settings into memory and few checks are made for validity. If the Juno-106 becomes unusable due to non valid data you may need to do a full restore of the Juno-106 which will lose all saved memory.

Table 1.0 Command ID	Data Byte	Data Type Byte details 7 ------- 0	Data Details
$01 (1) Request Global Dump	No Data		Juno-106 transmits a $02 (2) command
$02 (2) Transmit or Receive Global Dump 48 data bytes	$00 (0) = Midi Channel In	000yxxxx	xxxx = 0-15 for midi channel 1-16 y = set for Omni
	$01 (1) = Midi Channel Out	0000xxxx	xxxx = 0-15 for midi channel 1-16
	$02 (2) = Seq Midi Channel Out	0000xxxx	xxxx = 0-15 for midi channel 1-16
	$03 (3) = Device ID	0000xxxx	xxxx = 0-15 for ID 1-16
	$04 (4) = Enable MidiCC	000000xx	xx = 00=Off 01=CC Receive Enabled (Default) 02=CC Transmit Enabled 03=CC Receive & Transmit Enabled Note - Mod Wheel CC will always send NOTE - If the Vyzex editor is running midiCC Control changes will not be transmitted even if enabled
	$05 (5) = Enable Sysex	0000000x	x = Off/On (set=On)
	$06 (6) = Enable Program Change	000000xx	xx = 00=None 01=PC Receive Enabled (Default) 02=PC Transmit Enabled 03=PC Receive & Transmit Enabled
	$07 (7) = Midi Soft Through	000000xx	xx = 00=Stop all 01=Pass all 10=Pass only nonCC 11=Stop only CC we have used Note - Midi real time (>$F8) will always pass Note - SysEx intended for the Juno-106 will not be passed Note - Active Sensing commands are suppressed within the 106 and not passed on
	$08 (8) = Enable Midi Clock Gen	0000000x	x = Off/On (set=On)
	$09 (9) = Internal Velocity	0xxxxxxx	x = Range $00-$7f (0-127)
	$0a (10) = Master Clock Source	000000xx	xx= 000-Internal 001-Midi 010-Ext Step 011-Ext 24ppqn 100-Ext 48ppqn Note - Master Clock will be divided according to the Arp/Seq/LFO Clock Divide options
	$0b (11) = Not Used	00000000	

Table 1.0 Command ID	Data Byte	Data Type Byte details 7 ------- 0	Data Details
	$0c (12) = Not Used	00000000	
	$0d (13) = Not Used	00000000	
	$0e (14) = Pattern Level Hi	000xxxxx	
	$0f (15) = Pattern Level Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$10 (16) = Pattern Control	00000xyz	y = VCA Amount Destination - 0=Off 1=On z = VCF Cutoff Destination - 0=Off 1=On x = Clock Source - 0=Arp 1=Seq
	$11 (17) = Int Clock Rate Hi	0000xxxx	
	$12 (18) = Int Clock Rate Lo	0000yyyy	This byte is sent as two nibbles which are combined to make single 8 bit command. 0000xxxx + 0000yyyy = xxxxyyyy Range is 0-255 for 5-300 BPM
	$13 (19) = MW Level	0xxxxxxx	x = Range $00-$7f (0-127)
	$14 (20) = AT Level	0xxxxxxx	x = Range $00-$7f (0-127)
	$15 (21) = Key Trans Disable	0000000x	x = Disable Key Transpose (0=enable,1=disable)
	$16 (22) = Display Mode	000000yz	z = Clock Display - 0=Off 1=On y = Scrolling Display - 0=Off 1=On
	$17 (23) = Memory Protect	0000000z	z = Memory Protect - 0=Protected 1=Not Protected Note - This is read only and can only be changed by the Memory Protect Switch on the rear of the Juno-106
	$18-$1f (24-31) = Nulls		Not currently Used

$03 (3) Request Patch Edit Buffer Dump	No Data		

$04 (4) Transmit/Receive Patch Edit Buffer Dump Null x 2 + 128 data bytes	2 x Null + 128 bytes data		2 x null bytes sent followed by 128 bytes of data in the following format
	$00-$13 (0-19) = Patch Name	Ascii Bytes	Patch Name

Table 1.0 Command ID	Data Byte	Data Type Byte details 7 ------- 0	Data Details
	$14 (20)=DCO Wave/Range	0000zyxx	xx = DCO Range 00=16' 01=8' 10=4' y = Saw On/Off (set=on) z = Pulse On/Off (set=on)
	$15 (21)=DCO Env Amount Hi	000xxxxx	
	$16 (22)=DCO Env Amount Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$17 (23)=DCO LFO Amount Hi	000xxxxx	
	$18 (24)=DCO LFO Amount Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$19 (25)=DCO Bend Mod Amount Hi	000xxxxx	
	$1a (26)=DCO Bend Mod Amount Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$1b (27)=DCO Bend LFO Mod Amount Hi	000xxxxx	
	$1c (28)=DCO Bend LFO Mod Amount Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$1d (29)=DCO PWM Amount Hi	000xxxxx	
	$1e (30)=DCO PWM Amount Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$1f (31)=DCO Control	0000000u 0vwxxxyz	z = DCOENV(0=ENV1,1=ENV2) y = DCOLFO(0=LFO1,1=LFO2) xxx = PWM Source 000=Manual 001=LFO1 010=LFO2 011=ENV1 100=ENV2 w = DCO ENV(0=Norm,1=Inverted) v = PWM ENV(0=Norm,1=Inverted) u = LFO POL(0=Norm,1=Inverted)
	$20 (32)=Sub Level Hi	000xxxxx	
	$21 (33)=Sub Level Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$22 (34)=Noise Level Hi	000xxxxx	
	$23 (35)=Noise Level Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy

Table 1.0 Command ID	Data Byte	Data Type Byte details 7 ------- 0	Data Details
	$24 (36)=HPF Level	000000xx	xx = 0-3
	$25 (37)=VCF Cutoff Hi	000xxxxx	
	$26 (38)=VCF Cutoff Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$27 (39)=VCF Resonance Hi	000xxxxx	
	$28 (40)=VCF Resonance Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$29 (41)=VCF LFO Amount Hi	000xxxxx	
	$2a (42)=VCF LFO Amount Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$2b (43)=VCF ENV Amount Hi	000xxxxx	
	$2c (44)=VCF ENV Amount Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$2d (45)=VCF Key Amount Hi	000xxxxx	
	$2e (46)=VCF Key Amount Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$2f (47)=VCF Bend Mod Amount Hi	000xxxxx	
	$30 (48)=VCF Bend Mod Amount Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$31 (49)=VCF Control	0000wxyz	z = VCFEnv(0=Env1,1=ENV2) y = VCFLFO(0=LFO1,1=LFO2) x = Env(0=Norm,1=Inverted) w = LFO(0=Norm,1=Inverted)
	$32 (50)=Env 1 Attack Hi	000xxxxx	
	$33 (51)=Env 1 Attack Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$34 (52)=Env 1 Decay Hi	000xxxxx	
	$35 (53)=Env 1 Decay Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$36 (54)=Env 1 Sustain Hi	000xxxxx	
	$37 (55)=Env 1 Sustain Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$38 (56)=Env 1 Release Hi	000xxxxx	
	$39 (57)=Env 1 Release Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy

Table 1.0 Command ID	Data Byte	Data Type Byte details 7 ------- 0	Data Details
	$3a (58)=Env 2 Attack Hi	000xxxxx	
	$3b (59)=Env 2 Attack Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$3c (60)=Env 2 Decay Hi	000xxxxx	
	$3d (61)=Env 2 Decay Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$3e (62)=Env 2 Sustain Hi	000xxxxx	
	$3f (63)=Env 2 Sustain Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$40 (64)=Env 2 Release Hi	000xxxxx	
	$41 (65)=Env 2 Release Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$42 (66)=Env Control	Not used	
	$43 (67)=LFO 1 Wave	000000xxx	xxx = 000=Sine 001=Triangle 010=Square 011=Saw 100=Reverse Saw 101=Random
	$44 (68)=LFO 1 Rate Hi	000xxxxx	
	$45 (69)=LFO 1 Rate Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$46 (70)=LFO 1 Delay Hi	000xxxxx	
	$47 (71)=LFO 1 Delay Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$48 (72)=LFO 2 Wave	000000xxx	xxx = 000=Sine 001=Triangle 010=Square 011=Saw 100=Reverse Saw 101=Random
	$49 (73)=LFO 2 Rate Hi	000xxxxx	
	$4a (74)=LFO 2 Rate Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$4b (75)=LFO 2 Delay Hi	000xxxxx	
	$4c (76)=LFO 2 Delay Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy

Table 1.0 Command ID	Data Byte	Data Type Byte details 7 ------- 0	Data Details
	$4d (77) LFO1 Control	00xxxxxz	z = LFO1 Mode (0=Normal,1=Plus) xxxxx= 00000-Free Running 00001-Sync Two Notes (192 Clocks/Step) 00010-Sync Dotted Whole Note (144 Clocks/Step) 00011-Sync Whole Note (96 Clocks/Step) 00100-Sync Dotted Half Note (72 Clocks/Step) 00101-Sync Half Note (48 Clocks/Step) 00110-Sync Dotted 1/4 Note (36 Clocks/Step) 00111-Sync Quarter note (24 Clocks/Step) 01000-Sync Dotted 1/8 Note (18 Clocks/Step) 01001-Sync 1/4 Note Triplets (16 Clocks/Step) 01010-Sync 8th note (12 Clocks/Step) 01011-Sync 8th note triplets (8 Clocks/Step) 01100-Sync 16th note (6 Clocks/Step) 01101-Sync 16th note triplets (4 Clocks/Step) 01110-Sync 32nd note (3 Clocks/Step) 01111-Sync 32nd note triplets (2 Clocks/Step) 10000-Sync 64th note triplets (1 Clocks/Step) Sync source is Master Clock
	$4e (78)=Chorus Control	000000xx	xx = 00=off 01=Type 1 10=type 2
	$4f (79)=VCA Level Hi	000xxxxx	
	$50 (80)=VCA Level Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$51 (81)=VCA LFO Mod Amount Hi	000xxxxx	
	$52 (82)=VCA LFO Mod Amount Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$53 (83)=VCA Control	000v0xyz	z = Gate (1=gate on - overrides bit y) y = Env1/2 (0=Env1) x = LFO1/2 (0=LFO1) v = LFO(0=Norm,1=Inverted)
	$54 (84)=Portamento Rate Hi	000xxxxx	
	$55 (85)=Portamento Rate Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$56 (86)=Portamento Control	0000000x	x = 0=Off 1=On
	$58 (87)=Load Sequence	0000xxxx	Seq number to load (0-8) - 0 is do not load Seq
	$57 (88)=Load Pattern	0000xxxx	Pattern number to load (0-8) - 0 is do not load Pattern

Table 1.0 Command ID	Data Byte	Data Type Byte details 7 ------- 0	Data Details
	$59 (89)=Voice Mode	00000xxx	xxx = 0=Poly1 (7th note robs oldest) 1=Poly2 (7th note ignored) 2=Unison Legato 3=Unison Staccato 4=Mono Legato 5=Mono Staccato
	$5a (90)=Voice Detune Amount Hi	000xxxxx	
	$5b (91)=Voice Detune Amount Lo	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
	$5c (92)=Detune Control	0000000x	x = 0=unison only,1=All modes except Mono
	$5d (93)=Arp Control	00yyy0zz	zz = 00=1Oct,01=2Oct,10=3Oct yyy = 000=Up,001=Dn,010=U/D,011=Rndm, 100=As Played
	$5e (94)=AT Control	00000xyz	z = DCO LFO (1=on) y = VCF Cutoff (1=on) x = VCA Level (1=on)
	$5f (95)=MW Control	00000xyz	z = DCO LFO (1=on) y = VCF Cutoff (1=on) x = VCA Level (1=on)
	$60 (96)=Midi Control	0000wxyz	z = Arp Enable (1=Enabled) y = Sequence Enable (1=Enabled) x = Pattern Enable (1=Enabled) w = Hold Enabled (1=Hold On)
	$61 (97)=Patch Clock Tempo	0000xxxx 0000yyyy	If this is nonzero it will replace the internal Clock speed with this value. If this value is zero the internal clock will remain unchanged. This byte is sent as two nibbles which are combined to make single 8 bit command. 0000xxxx + 0000yyyy = xxxxyyyy
	$63 (99) Arp Clock Divide	0000yyyy	yyyy= 0000-Half Note (48 Clocks/Step) 0001-Quarter note (24 Clocks/Step) 0010-8th note (12 Clocks/Step) 0011-8th note, half swing (14,10 Clocks/Step) 0100-8th note, full swing (16,8 Clocks/Step) 0101-8th note triplets (8 Clocks/Step) 0110-16th note (6 Clocks/Step) 0111-16th note, half swing (7,5 Clocks/Step) 1000-16th note, full swing (8,4 Clocks/Step) 1001-16th note triplets (4 Clocks/Step) 1010-32nd note (3 Clocks/Step) 1011-32nd note triplets (2 Clocks/Step) 1100-64th note triplets (1 Clocks/Step) Clock source is Master Clock

Table 1.0 Command ID	Data Byte	Data Type Byte details 7 ------- 0	Data Details
	$64 (100) Seq Control	000vwxyz	z = Reserved y = KeyDownPlay (0=Seq always plays when enabled, 1=Seq only plays when enabled AND a Key is being held down) x = AutoTranspose (0=actual seq notes,1=transpose last played) w = AutoTransposeReset (0=continue seq in new transpose, 1=reset seq to step 1 on new transpose value) v = Reserved
	$65 (101) Seq Transpose	0-36	0-36 (-1 oct -> +2 Octs) - only used if SeqControl Bit 2 set
	$66 (102) Dynamics Control	0000yyzz	zz = VCF Cutoff Enable(0-3) yy = VCA Amount Enable(0-3) 0=off,1=30%,2=60%,3=100%
	$67 (103) LFO2 Control	00xxxxxz	z = LFO2 Mode (0=Normal,1=Plus) xxxxx= 00000-Free Running 00001-Sync Two Notes (192 Clocks/Step) 00010-Sync Dotted Whole Note (144 Clocks/Step) 00011-Sync Whole Note (96 Clocks/Step) 00100-Sync Dotted Half Note (72 Clocks/Step) 00101-Sync Half Note (48 Clocks/Step) 00110-Sync Dotted 1/4 Note (36 Clocks/Step) 00111-Sync Quarter note (24 Clocks/Step) 01000-Sync Dotted 1/8 Note (18 Clocks/Step) 01001-Sync 1/4 Note Triplets (16 Clocks/Step) 01010-Sync 8th note (12 Clocks/Step) 01011-Sync 8th note triplets (8 Clocks/Step) 01100-Sync 16th note (6 Clocks/Step) 01101-Sync 16th note triplets (4 Clocks/Step) 01110-Sync 32nd note (3 Clocks/Step) 01111-Sync 32nd note triplets (2 Clocks/Step) 10000-Sync 64th note triplets (1 Clocks/Step) Sync source is Master Clock

Table 1.0 Command ID	Data Byte	Data Type Byte details 7 ------- 0	Data Details
	$68 (104) Seq Clock Divide	0000yyyy	yyyy= 0000-Half Note (48 Clocks/Step) 0001-Quarter note (24 Clocks/Step) 0010-8th note (12 Clocks/Step) 0011-8th note, half swing (14,10 Clocks/Step) 0100-8th note, full swing (16,8 Clocks/Step) 0101-8th note triplets (8 Clocks/Step) 0110-16th note (6 Clocks/Step) 0111-16th note, half swing (7,5 Clocks/Step) 1000-16th note, full swing (8,4 Clocks/Step) 1001-16th note triplets (4 Clocks/Step) 1010-32nd note (3 Clocks/Step) 1011-32nd note triplets (2 Clocks/Step) 1100-64th note triplets (1 Clocks/Step) Clock source is Master Clock
	$69-$7f (105-127)	Not used	All set to $00
$05 (5) Request Patch Dump Bank + Patch	Bank Number	000000xx	xx = 0 for Patches 1-128 1 for Patches 129-256 2 for Patches 257-384 3 for Patches 385-512
WARNING! This command will overwrite the current sounding Patch with the Patch selected	Patch Number	0xxxxxxx	x = 0-127 Juno-106 transmits a $06 (6) command
$06 (6) Transmit/Receive Patch Dump Bank + Patch + 128 data bytes	Bank Number	000000xx	xx = 0 for Patches 1-128 1 for Patches 129-256 2 for Patches 257-384 3 for Patches 385-512
WARNING! This command will overwrite the current sounding Patch with the Patch selected	Patch Number	0xxxxxxx	x = 0-127 for Patch 1-128 Juno-106 transmits data in the same format as the $04 Command
$07 (7) Request Pattern Dump Pattern Number	Pattern Number	0000xxxx	x = 0-7 for pattern 1-8 Juno-106 transmits a $08 (8) command
WARNING! This command will overwrite the current sounding Pattern with the Pattern selected			

Table 1.0 Command ID	Data Byte	Data Type Byte details 7 ------- 0	Data Details
$08 (8) Transmit/Receive Pattern Dump Pattern Number + 29 data bytes	Pattern Number	0000xxxx	x = 0-7 for pattern 1-8
WARNING! This command will overwrite the current sounding Pattern with the Pattern selected	$00-$13 (0-19) = Pattern Name	Ascii Bytes	Pattern Name
	$14 (20) = Pattern Byte 1	0000wxyz	w = Pattern Section 16 (set=sounding) x = Pattern Section 15 y = Pattern Section 14 z = Pattern Section 13
	$15 (21) = Pattern Byte 2	0000wxyz	w = Pattern Section 12 (set=sounding) x = Pattern Section 11 y = Pattern Section 10 z = Pattern Section 9
	$16 (22) = Pattern Byte 3	0000wxyz	w = Pattern Section 8 (set=sounding) x = Pattern Section 7 y = Pattern Section 6 z = Pattern Section 5
	$17 (23) = Pattern Byte 3	0000wxyz	w = Pattern Section 4 (set=sounding) x = Pattern Section 3 y = Pattern Section 2 z = Pattern Section 1
	$18-$1b (24-27)	Not Used	
	$1c (28) = Pattern Length	0000xxxx	xxxx = 1-15 (2-16)
$09 (9) Request Seq Dump Seq Number	Sequence Number	0000xxxx	x = 0-7 for Sequence 1-8 Juno-106 transmits a $0a (10) command
WARNING! This command will overwrite the current sounding Seq with the Seq selected			
$0a (10)Transmit / Receive Seq Dump Seq Number + 1800 data bytes	Sequence Number	0000xxxx	x = 0-7 for Sequence 1-8
WARNING! This command will overwrite the current sounding Seq with the Seq selected	$00-$13 (0-19) = Seq Name	20 Ascii Bytes	Sequence Name
	$14 (20) = Seq Length	0xxxxxxx	x = 0 = No Seq Recorded 1-124 = No of Seq Steps

Table 1.0 Command ID	Data Byte	Data Type Byte details 7 ------- 0	Data Details
	$15-$2e (21-46) = Reserved		26 bytes Reserved for future expansion
	$2f-$67b (47-1659) = Seq Steps	124 x 13 (1612) Note 1 0xxxxxxx Note 2 0xxxxxxx Note 3 0xxxxxxx Note 4 0xxxxxxx Note 5 0xxxxxxx Note 6 0xxxxxxx Byte 7 00abcdef Byte 8 0xxxxxxx Byte 9 0xxxxxxx Byte 10 0xxxxxxx Byte 11 0xxxxxxx Byte 12 0xxxxxxx Byte 13 0xxxxxxx	Step is 13 bytes Byte 1-6 xxxxxxx = note number (32-96) Note Bytes are $00 (0) if not used Byte 7 a-f is tie bits 1-6 (set if tie set) Byte 8-13 xxxxxxx = voice 1-6 Level (0-127)
$0b (11) Request Patch Name			Juno-106 transmits a $0c (12) command
$0c (12)Transmit / Receive Patch Name 20 data bytes	$00-$13 (0-19) = Patch Name	Ascii Bytes	Patch Name This command will only effect the edit buffer. The Patch must be saved or the changes will be lost on patch change or power off.
$0d (13) Request Edit Buffer Patch Parameter 0 Data Bytes	$00 (0) - Patch Parameter Number Data format the same as $04 Parameter Number is Data Posn	0xxxxxxx	x = Data Offset Use Data Position for Parameter Number e.g. $25=VCFCutoffHi Juno-106 transmits a $0e (14) command
$0e (14) Transmit / Receive Edit Buffer Patch Parameter 2 data bytes	$00 (0) - Patch Parameter Number Data format the same as $04	0xxxxxxx	x = Data Offset Use Data Position for Parameter Number e.g. $25=VCFCutoffHi
	$01 (1) - Parameter Value (Hi)	000xxxxx	Data format depends on Parameter Data format the same as $04 Note - This byte is $00 for all non 12 bit parameters
	$02 (2) - Parameter Value (Lo)	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy

Table 1.0 Command ID	Data Byte	Data Type Byte details 7 ------- 0	Data Details
$0f (15) Request Global Parameter 0 Data Bytes	$00 (0) - Global Parameter Number	000xxxxx	x = Data Offset Use Data Position for Parameter Number Data format the same as $02 e.g. $00 (0) = Midi Channel In Note - reply will be 2 data bytes for all 12 bit returns and 2 bytes with a leading $00 for all others
$10 (16) Transmit / Receive Global Parameter 2 data bytes	$00 (0) - Global Parameter Number	000xxxxx	x = Data Offset Use Data Position for Parameter Number Data format the same as $02 e.g. $00 (0) = Midi Channel In
	$01 (1) - Parameter Value (Hi)	000xxxxx	Data format depends on Parameter Data format the same as $04 Note - This byte is $00 for all non 12 bit parameters
	$02 (2) - Parameter Value (Lo)	0yyyyyyy	Hi & Lo are combined to make single 12 bit command. 000xxxxx + 0yyyyyyy = 0000xxxx xyyyyyyy
$11 (17) Request Pattern Edit Buffer Dump		No Data	Juno-106 transmits a $12 (18) command
$12 (18) Transmit/Receive Edit Pattern Dump Null + 29 data bytes	Null + 29 bytes Data		Data Format is the same is $08 Command (with 0 Pattern Number)
$13 (19) Request Sequence Edit Buffer Dump		No Data	Juno-106 transmits a $14 (20) command
$14 (20) Transmit/Receive Sequence Edit Buffer Dump Null + 892 data bytes	892 bytes Data		Data Format is the same is $0a (10) Command (with 0 Sequence Number)
$15 (21) Request Edit Buffer Seq Step	Sequence step	0xxxxxxx	x = 0-124 for Sequence step

$16 (22) Transmit / Receive Edit Buffer **Seq Step** Seq Step + 14 data bytes	Sequence step	0xxxxxxx	x = 0-124 for Sequence step
	Seq Length	0xxxxxxx	x = 0 = No Seq Recorded 1-124 = No of Seq Steps
	Seq Step	Note 1 0xxxxxxx Note 2 0xxxxxxx Note 3 0xxxxxxx Note 4 0xxxxxxx Note 5 0xxxxxxx Note 6 0xxxxxxx Byte 7 00abcdef Byte 8 0xxxxxxx Byte 9 0xxxxxxx Byte 10 0xxxxxxx Byte 11 0xxxxxxx Byte 12 0xxxxxxx Byte 13 0xxxxxxx	Step is 13 bytes Byte 1-6 xxxxxxx = note number (32-96) Note Bytes are $00 (0) if not used Byte 7 a-f is tie bits 1-6 (set if tie set) Byte 8-13 xxxxxxx = voice 1-6 Level (0-127)